ETSI TS 138 533 V15.0.0 (2019-05)

TECHNICAL SPECIFICATION

5G;
NR;
User Equipment (UE) conformance specification;
Radio Resource Management (RRM)
(3GPP TS 38.533 version 15.0.0 Release 15)

Reference
DTS/TSGR-0538533vf00

Keywords
5G

ETSI

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

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

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (https://ipr.etsi.org/).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

Foreword

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

The present document may refer to technical specifications or reports using their 3GPP identities, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under http://webapp.etsi.org/key/queryform.asp.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Contents

Foreword

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

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

Version x.y.z

where:

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

1 Scope

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

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

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

2 References

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

3 Definitions, symbols and abbreviations

3.1 Definitions

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

example: text used to clarify abstract rules by applying them literally.

Editor's note: intended to capture definitions

3.2 Symbols

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

<symbol> <Explanation>

Editor's note: intended to capture symbols

3.3 Abbreviations

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

BS	Base Station
BWP	Bandwidth Part
EN-DC	E-UTRA – NR Dual Connectivity
FR1	Frequency Range 1
FR2	Frequency Range 2
NR	New Radio

NSA	Non-Standalone
OCNG	OFDMA Channel Noise Generator
PSCell	Primary Secondary Cell
RMC	Reference Measurement Channel
SA	Standalone
SS	System Simulator

3A Requirements for the support of RRM

3A.1 General

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

- Clause 4 for EN-DC option 3 test cases where all NR cells are in FR1.
- Clause 5 for EN-DC option 3 test cases where at least one NR cell is in FR2.
- Clause 6 for SA option 2 test cases where all NR cells are in FR1.
- Clause 7 for SA option 2 test cases where at least one NR cell is in FR2.

The requirements that are tested include:

- Idle mode, the cell re-selection algorithms that are controlled by the setting of parameters (thresholds and hysteresis values) that define the best cell and/or determine when the UE should select a new cell

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

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

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

3A.1.1 Test coverage across 5G NR architecture options

The test cases in this specification cover both Standalone (FR1, FR2) as well as Non-Standalone FR1 and FR2 (E-UTRA and 5G NR interworking) testing. Below shall be the understanding with respect to coverage across 5G NR architecture options:

1. Unless otherwise stated within the test case, it shall be understood that test requirements for NSA Option 3 and 7 are agnostic of the NSA architecture option configured within the test. The test coverage across the mentioned

NSA options shall be considered fulfilled by execution of the NSA test case using one of them. Subsequently the test results can be leveraged to the other NSA option.

2. Only one SA or NSA architecture option type is identified and utilized in the definiton of each test case. For example, most NSA test cases are configured using Connectivity EN-DC i.e. NSA Option 3 and Standalone (SA) test cases are configured using Connectivity NR i.e. SA Option 2.

3. If a UE does not support NSA Option 3, NSA Option 7 can be configured to execute the test. This is accomplished by appropriately picking the generic procedure paremeter from Table 3A.1.1-2. The leverage rule detailed in (1) would apply.

Table 3A.1.1-1: Generic procedure parameter summary for SA

Generic Procedure Parameter to use in Initial Conditions		Description	5G NR SA Architecture Option supported by UE
Connectivity	*NR*	NG-RAN NR Radio Access	SA Option 2
	E-UTRA	NG-RAN E-UTRA Radio Access	SA Option 5

Editor's Note: Any additional test config details needed for SA Option 5 is FFS

Table 3A.1.1-2: Generic procedure parameter summary for NSA

Generic Procedure Parameter to use in Initial Conditions		Description	5G NR NSA Architecture Option supported by UE
Connectivity	**NSA**		
	EN-DC	E-UTRA-NR Dual Connectivity	NSA Option 3
	NE-DC	NR-E-UTRA Dual Connectivity	NSA Option 4
	NGEN-DC	NG-RAN E-UTRA-NR Dual Connectivity	NSA Option 7

Editor's Note: Any additional test config details needed for NSA Options 4 and 7 are FFS

3A.2 Requirements Classification for Statistical Testing

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

3A.3 Antenna Configuration

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

3A.4 NR band groups

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

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

3A.4.1 NR operating bands in FR1

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

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

Group	NR FDD		NR TDD	
	Band group notation	Operating bands	Band group notation	Operating bands
A	NR_FDD_FR1_A	n1, n70, n74[4]	NR_TDD_FR1_A	n34, n38, n39, n40, n50, n51
B	NR_FDD_FR1_B	n66, n74[3]	NR_TDD_FR1_B	-
C	NR_FDD_FR1_C	-	NR_TDD_FR1_C	n77[1], n78, n79
D	NR_FDD_FR1_D	n28	NR_TDD_FR1_D	n77[2]
E	NR_FDD_FR1_E	n2, n5, n7	NR_TDD_FR1_E	n41
F	NR_FDD_FR1_F	-	NR_TDD_FR1_F	-
G	NR_FDD_FR1_G	n3, n8, n12, n20, n71	NR_TDD_FR1_G	-
H	NR_FDD_FR1_H	n25	NR_TDD_FR1_H	-
NOTE 1: Except 3.8 GHz to 4.2 GHz. NOTE 2: Only 3.8 GHz to 4.2 GHz. NOTE 3: Except 1475.9 MHz to 1510.9 MHz. NOTE 4: Only when the band is confined in 1475.9 MHz to 1510.9 MHz.				

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

Group	NR FDD		NR TDD	
	Band group notation	Power Offset [dB], Δ_{BG_offset}	Band group notation	Power Offset [dB], Δ_{BG_offset}
A	NR_FDD_FR1_A	-	NR_TDD_FR1_A	0.0
B	NR_FDD_FR1_B	0.5	NR_TDD_FR1_B	0.5
C	NR_FDD_FR1_C	1.0	NR_TDD_FR1_C	1.0
D	NR_FDD_FR1_D	1.5	NR_TDD_FR1_D	1.5
E	NR_FDD_FR1_E	2.0	NR_TDD_FR1_E	2.0
F	NR_FDD_FR1_F	2.0	NR_TDD_FR1_F	2.0
G	NR_FDD_FR1_G	3.0	NR_TDD_FR1_G	3.0
H	NR_FDD_FR1_H	3.5	NR_TDD_FR1_H	3.5
NOTE 1: In the test parameters table, only the power configuration for NR_FDD_FR1_A or NR_TDD_FR1_A will be given.				

3A.4.2 NR operating bands in FR2

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

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

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

Table 3A.4.2-2: Power offsets for the test configuration between NR frequency band groups for FR2 with respect to NR_TDD_FR2_A

Group	Band group notation	Power Offset [dB], Δ_{BG_offset}
A	NR_TDD_FR2_A	-
B	NR_TDD_FR2_B	TBD
C	NR_TDD_FR2_C	TBD
D	NR_TDD_FR2_D	TBD
E	NR_TDD_FR2_E	TBD
F	NR_TDD_FR2_F	TBD
G	NR_TDD_FR2_G	TBD
H	NR_TDD_FR2_H	TBD
I	NR_TDD_FR2_I	TBD
J	NR_TDD_FR2_J	TBD
K	NR_TDD_FR2_K	TBD
L	NR_TDD_FR2_L	TBD
M	NR_TDD_FR2_M	TBD
N	NR_TDD_FR2_N	TBD
O	NR_TDD_FR2_O	TBD
P	NR_TDD_FR2_P	TBD
Q	NR_TDD_FR2_Q	TBD
R	NR_TDD_FR2_R	TBD
S	NR_TDD_FR2_S	TBD
T	NR_TDD_FR2_T	TBD
U	NR_TDD_FR2_U	TBD
V	NR_TDD_FR2_V	TBD
W	NR_TDD_FR2_W	TBD
X	NR_TDD_FR2_X	TBD
Y	NR_TDD_FR2_Y	TBD
NOTE 1: In the test parameters table, only the power configuration for NR_TDD_FR2_A will be given.		

3A.5 NR operating band configuration

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

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

Band under test	Additional band
TBD	TBD
Note 1: The band under test should contain the inter-frequency (neighbour) cell. Note 2: The additional band should contain the serving cell of the test. If more than one inter-frequency cell is needed, that cell should be on the additional band. Note 3: The bands and cells referred in this table are NR bands and cells only. For instructions on how to configure the E-UTRA operating band please refer to TS 36.521-3 [26].	

4 EN-DC with all NR cells in FR1

This section contains test scenarios for E-UTRA and NR dual connectivity with E-UTRA as PCell and NR and PSCell. This configuration is also known as NSA Option 3 and 3a. All NR cells are in Frequency Range 1.

4.1 Void

4.2 Void

4.3 RRC_CONNECTED state mobility

4.3.1 Void

4.3.2 RRC connection mobility control

4.3.2.1 Void

4.3.2.2 Random access

4.3.2.2.1 Contention based random access test in FR1 for PSCell in EN-DC

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Message contents

- Cell mapping

- Test procedure update to initiate SCell Random Access procedure by PDCCH order

4.3.2.2.1.1 Test purpose

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

4.3.2.2.1.2 Test applicability

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

4.3.2.2.1.3 Minimum conformance requirement

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

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

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

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

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

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

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

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

The UE shall re-transmit the msg3 upon the reception of a NACK on msg3.

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

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

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

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

4.3.2.2.1.4 Test description

4.3.2.2.1.4.1 Initial conditions

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

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

Test Case ID	Test Config Index	Description
4.3.2.2.1-1	1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.3.2.2.1-2	2	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.3.2.2.1-3	3	LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.3.2.2.1-4	4	LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations		

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

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

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] subclause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 4.3.2.2.1.4.1-1.	

Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

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

4.3.2.2.1.4.2 Test procedure

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

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters *Connectivity* EN-DC according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4.3.2.2.1.5-1.
3. After power-up and cell selection, the UE shall trigger a random access procedure to establish an RRC connection on the NR PSCell.
4. Test 1: Correct behaviour when transmitting Random Access Preamble

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

5. Test 2: Correct behaviour when receiving Random Access Response

   5.1. Repeat steps 1-3.

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

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

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

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

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

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

6.1. Repeat steps 1-3.

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

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

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

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

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

7. Test 4: Correct behaviour when receiving a NACK on msg3

7.1. Repeat steps 1-3.

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

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

7.4. The System Simulator shall NACK all UE msg3s.

7.5. The UE shall re-transmit the msg3 until the maximum number of HARQ re-transmissions is reached.

7.6. The System Simulator shall count the UE msg3s, and check that transmission stops when the maximum number of HARQ re-transmissions is reached.

8. Test 5: Correct behaviour when receiving an unsuccessful UE Contention Resolution

8.1. Repeat steps 1-3.

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

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

8.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element not matching the CCCH SDU transmitted in msg3 uplink message.

8.5. As the UE Contention Resolution Identity included in the MAC control element did not match the CCCH SDU transmitted in the uplink message, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

8.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 4.3.2.2.1.5.

9. Test 6: Correct behaviour when receiving a successful UE Contention Resolution

9.1. Repeat steps 1-3.

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

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

9.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in msg3 uplink message.

9.5. As the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU, the Contention Resolution is successful and the UE shall send ACK.

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

10.1. Repeat steps 1-3.

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

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

10.4. The System Simulator shall not send a response.

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

10.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 4.3.2.2.1.5.

4.3.2.2.1.4.3 Message contents

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

FFS

4.3.2.2.1.5 Test requirement

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

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

Parameter			Unit	Test-1	Comments
SSB Configuration	Config 1,2			SSB.1 FR1	As defined in A.3.1, except for number of SSBs per SS-burst and SS/PBCH block index as below
	Config 3,4			SSB.2 FR1	
Number of SSBs per SS-burst				2	Different from the definition in A.3.1
SS/PBCH block index				0,1	Different from the definition in A.3.1
Duplex Mode for Cell 2	Config 1,2			FDD	
	Config 3,4			TDD	
TDD Configuration	Config 3,4			TDDConf.1.2	
OCNG Pattern Note 1				OCNG pattern 1	As defined in A.2.1.
PDSCH parameters Note 4	Config 1,2			SR1.1 FDD	As defined in A.1.1.
	Config 3,4			SR.2.1 TDD	
NR RF Channel Number				1	
EPRE ratio of PSS to SSS			dB	0	
EPRE ratio of PBCH_DMRS to SSS			dB		
EPRE ratio of PBCH to PBCH_DMRS			dB		
EPRE ratio of PDCCH_DMRS to SSS			dB		
EPRE ratio of PDCCH to PDCCH_DMRS			dB		
EPRE ratio of PDSCH_DMRS to SSS			dB		
EPRE ratio of PDSCH to PDSCH_DMRS			dB		
SSB with index 0	$\hat{E}_s/I_{ot}$		dB	3	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1,2	dBm/15kHz	-98	
		Config 3,4		-101	
	$\hat{E}_s/N_{oc}$		dB	3	
	SS-RSRP Note 3		dBm/ SCS	-95	
SSB with index 1	$\hat{E}_s/I_{ot}$		dB	-17	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1,2	dBm/15kHz	-98	
		Config 3,4		-101	
	$\hat{E}_s/N_{oc}$		dB	-17	
	SS-RSRP Note 3		dBm/ SCS	-115	
Io Note 2	Config 1,2		dBm	-65.3/9.36MHz	For symbols without SSB index 1
	Config 3,4			-62.2/38.16MHz	
ss-PBCH-BlockPower			dBm/ SCS	-5	As defined in clause 6.3.2 in TS 38.331 [13].
Configured UE transmitted power ($P_{\mathrm{CMAX,\ f,c}}$)			dBm	23	As defined in clause 6.2.4 in TS 38.101-1 [2].
PRACH Configuration				PRACH.1 FR1	As defined in A.7.1.
Propagation Condition			-	AWGN	
Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. Note 2: Es/Iot, SS-RSRP and Io level have been derived from other parameters for information purpose. They are not settable parameters. Note 3: Void. Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.					

Test 1: Correct behaviour when transmitting Random Access Preamble

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

Test 2: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be -30 dBm within the accuracy specified in Table 4.3.2.2.1.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.1.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.1.5-4.

Test 3: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be -30 dBm within the accuracy specified in Table 4.3.2.2.1.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.1.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.1.5-4.

Test 4: Correct behaviour when receiving a NACK on msg3

- The UE shall re-transmit the msg3 upon the reception of a NACK on msg3 until the maximum number of HARQ retransmission is reached.

Test 5: Correct behaviour when receiving an incorrect message over Temporary C-RNTI

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires.
- The power of the first preamble shall be -30 dBm within the accuracy specified in Table 4.3.2.2.1.5-2.
- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 4.3.2.2.1.5-4.

Test 6: Correct behaviour when receiving a correct message over Temporary C-RNTI

- The UE shall send ACK if the contention resolution is successful.

Test 7: Correct behaviour when contention resolution timer expires

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires if the contention resolution timer expires.
- The power of the first preamble shall be -30 dBm within the accuracy specified in Table 4.3.2.2.1.5-2.
- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 4.3.2.2.1.5-4.

Table 4.3.2.2.1.5-2 Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± 11.1 dB

Table 4.3.2.2.1.5-3 Relative power tolerance Test requirements

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

Table 4.3.2.2.1.5-4: T_e Timing error Test requirements

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

4.3.2.2. Non-contention based random access test in FR1 for PSCell in EN-DC

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Message contents

- Cell mapping

- Test procedure update to initiate SCell Random Access procedure by PDCCH order

4.3.2.2.2.1 Test purpose

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

4.3.2.2.2.2 Test applicability

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

4.3.2.2.2.3 Minimum conformance requirement

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

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

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

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

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

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

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

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

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

4.3.2.2.2.4 Test description

4.3.2.2.2.4.1 Initial conditions

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

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

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

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

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

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

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

4.3.2.2.2.4.2 Test procedure

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

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters *Connectivity* EN-DC according to TS 38.508-1 [14] clause 4.5.

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

3. After power-up and cell selection, the UE shall trigger a random access procedure to establish an RRC connection on the NR PSCell.

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

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

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

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

   5.2. Repeat steps 1-3

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

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

   6.1. Repeat steps 1-3

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

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

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

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

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

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

   7.1. Repeat steps 1-3.

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

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

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

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

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

4.3.2.2.2.4.3 Message contents

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

FFS

4.3.2.2.2.5 Test requirement

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

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

Parameter			Unit	Test-1	Test-2	Comments
SSB Configuration	Config 1,2			SSB.1 FR1	SSB.1 FR1	As defined in A.3.1, except for number of SSBs per SS-burst and SS/PBCH block index as below
	Config 3,4			SSB.2 FR1	SSB.2 FR1	
Number of SSBs per SS-burst				2	2	Different from the definition in A.3.1
SS/PBCH block index				0,1	0,1	Different from the definition in A.3.1
CSI-RS Configuration	Config 1,2			N/A	CSI-RS.1.1 FDD	As defined in A.1.4
	Config 3,4				CSI-RS.2.1 TDD	
Duplex Mode for Cell 2	Config 1,2			FDD	FDD	
	Config 3,4			TDD	TDD	
TDD Configuration	Config 3,4			TDDConf.1.2	TDDConf.1.2	
OCNG Pattern Note 1				OCNG pattern 1	OCNG pattern 1	As defined in A.2.1.
PDSCH parameters Note 4	Config 1,2			SR1.1 FDD	SR1.1 FDD	As defined in A.1.1.
	Config 3,4			SR2.1 TDD	SR2.1 TDD	
NR RF Channel Number				1	1	
EPRE ratio of PSS to SSS			dB	0	0	
EPRE ratio of PBCH_DMRS to SSS			dB			
EPRE ratio of PBCH to PBCH_DMRS			dB			
EPRE ratio of PDCCH_DMRS to SSS			dB			
EPRE ratio of PDCCH to PDCCH_DMRS			dB			
EPRE ratio of PDSCH_DMRS to SSS			dB			
EPRE ratio of PDSCH to PDSCH_DMRS			dB			
SSB with index 0	$\hat{E}_s/I_{ot}$		dB	3	3	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1,2	dBm/15kHz	-98	-98	
		Config 3,4		-101	-101	
	$\hat{E}_s/N_{oc}$		dB	3	3	
	SS-RSRP Note 3		dBm/ SCS	-95	-95	
SSB with index 1	$\hat{E}_s/I_{ot}$		dB	-17	-17	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1,2	dBm/15kHz	-98	-98	
		Config 3,4		-101	-101	
	$\hat{E}_s/N_{oc}$		dB	-17	-17	
	SS-RSRP Note 3		dBm/ SCS	-115	-115	
Io Note 2	Config 1,2		dBm	-65.3/9.36MHz	-65.3/9.36MHz	For symbols without SSB index 1
	Config 3,4			-62.2/38.16MHz	-62.2/38.16MHz	
ss-PBCH-BlockPower			dBm/ SCS	-5	-5	As defined in clause 6.3.2 in TS 38.331 [13].
Configured UE transmitted power ($P_{\mathrm{CMAX,\ f,c}}$)			dBm	23	23	As defined in clause 6.2.4 in TS 38.101-1 [2].
PRACH Configuration				PRACH.2 FR1	PRACH.3 FR1	As defined in A.7.1.
Propagation Condition			-	AWGN	AWGN	

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

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

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

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

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

Test 3: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be -30 dBm within the accuracy specified in Table 4.3.2.2.2.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.2.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.2.5-4.

Test 4: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be -30 dBm within the accuracy specified in Table 4.3.2.2.2.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.2.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.2.5-4.

Table 4.3.2.2.2.5-2: Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± 11.1 dB

Table 4.3.2.2.2.5-3: Relative power tolerance Test requirements

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

Table 4.3.2.2.2.5-4: T_e Timing error Test requirements

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

4.3.2.3 Void

4.4 Timing

4.4.1 UE transmit timing

4.4.1.0 Minimum conformance requirements

4.4.1.0.1 Minimum conformance requirements for UE transmit timing accuracy

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

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

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

$(N_{\text{TA}} + N_{\text{TA offset}}) \times T_{\text{c}}$ (in T_c units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in clause 7.3 was applied. N_{TA} for other channels is not changed until next timing advance is received. The value of $N_{\text{TA offset}}$ depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). $N_{\text{TA offset}}$ is defined in Table 7.1.2-2.

Table 4.4.1.0.1-1: T_e Timing Error Limit

Frequency Range	SCS of SSB signals (KHz)	SCS of uplink signals s(KHz)	T_e
1	15	15	12*64*T_c
		30	10*64*T_c
		60	10*64*T_c
	30	15	8*64*T_c
		30	8*64*T_c
		60	7*64*T_c
2	120	60	3.5*64*T_c
		120	3.5*64*T_c
	240	60	3*64*T_c
		120	3*64*T_c
Note 1: T_c is the basic timing unit defined in TS 38.211 [6]			

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

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

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

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

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

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

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

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

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

Frequency Range	SCS of uplink signals (KHz)	T_q	T_p
1	15	[5.5]*64*T_c	[5.5]*64*T_c
	30	[5.5]*64*T_c	[5.5]*64*T_c
	60	[5.5]*64*T_c	[5.5]*64*T_c
2	60	[2.5]*64*T_c	[2.5]*64*T_c
	120	[2.5]*64*T_c	[2.5]*64*T_c
NOTE 1: T_c is the basic timing unit defined in TS 38.211 [6]			

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

4.4.1.1 EN-DC FR1 UE transmit timing accuracy

Editor's Note: The RMC for PDCCH in TS 38.133 contains square brackets

4.4.1.1.1 Test purpose

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

4.4.1.1.2 Test applicability

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

4.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.4.1.0.1.

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

4.4.1.1.4 Test Description

4.4.1.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-1 [17].

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

Table 4.4.1.1.4.1-1: Supported test configurations for FR1 PSCell

<table>
<tr><th>Configuration</th><th>Description</th></tr>
<tr><td>4.4.1.1-1</td><td>FDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz</td></tr>
<tr><td>4.4.1.1-2</td><td>TDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz</td></tr>
<tr><td>4.4.1.1-3</td><td>TDD, SSB SCS 30 KHz, data SCS 30KHz, BW 40MHz</td></tr>
<tr><td colspan="2">Note: The UE is only required to pass in one of the supported test configurations in FR1</td></tr>
</table>

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

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

<table>
<tr><th>Parameter</th><th colspan="2">Value</th><th>Comment</th></tr>
<tr><td>Test environment</td><td colspan="2">NC</td><td>As specified in TS 38.508-1 [14] clause 4.1.</td></tr>
<tr><td>Test frequencies</td><td colspan="3">As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.</td></tr>
<tr><td>Channel bandwidth</td><td colspan="3">As specified by the test configuration selected from Table 4.4.1.1.4.1-1</td></tr>
<tr><td>Propagation conditions</td><td colspan="2">AWGN</td><td>As specified in Annex C.2.2.</td></tr>
<tr><td rowspan="2">Connection Diagram</td><td>TE Part</td><td>A.3.1.7.1</td><td rowspan="2">As specified in TS 38.508-1 [14] Annex A.</td></tr>
<tr><td>DUT Part</td><td>A.3.2.3.4</td></tr>
<tr><td>Exceptions to connection diagram</td><td colspan="2">N/A</td><td></td></tr>
</table>

1. Message contents are defined in clause 6 4.4.1.1.4.3.

2. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2. The general test parameters are given in Table 4.4.1.4.5-4 below.

4. Downlink signals for NR cell are initially set up according to Annex C.1 TBD .

4.4.1.1.4.2 Test procedure

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

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

Following will be the test sequence for this test

1 Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [6] clause 4.5.

2 Set up E-UTRA PCell according to parameters given in Table A.3.7.2.1-1 and setup NR PSCell according to parameters given in Table 4.4.1.1.4-1.

3 After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within (N_{TA} + N_{TA_offset}) ± T_e of the first detected path of DL SSB.

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

   b. The T_e values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-1

4 The test system shall adjust the timing of the DL path by values given in Table 4.4.1.1.4.2-1

Table 4.4.1.1.4.2-1: Adjustment Value for DL Timing

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

5 The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Table 4.4.1.1.5-5. This will only be done for Test1.

6 The test system shall verify that the UE transmit timing offset stays within (N_{TA} + N_{TA_offset}) ± T_e of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment

4.4.1.1.4.3 Message contents

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

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

Derivation Path: TS 38.331 [6], clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
SRS-Config ::= SEQUENCE {			
srs-ResourceSetToReleaseList	Not present		
srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE {			
srs-ResourceSetId	0		
srs-ResourceIdList SEQUENCE (SIZE(1..maxNrofSRS-ResourcesPerSet)) OF {		0 for Config 1 and Config 2	
SRS-ResourceId[1]	0		
}			
resourceType CHOICE {			
periodic SEQUENCE {			
periodicityAndOffset-p		sl1 for Config 1 sl640 for Config 2	
}			
}			
usage	codebook		
alpha	Alpha		
p0	0		
pathlossReferenceRS CHOICE {			
ssb-Index	SSB-Index		
}			
srs-PowerControlAdjustmentStates	Not present		
}			
srs-ResourceToReleaseList	Not present		
srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE {			
srs-ResourceId	0		
nrofSRS-Ports	Port1		
ptrs-PortIndex	Not present		
transmissionComb CHOICE {			
n2 SEQUENCE {			
combOffset-n2	0		
cyclicShift-n2	0		
}			
}			
resourceMapping SEQUENCE {			
startPosition	0		
nrofSymbols	n1		
repetitionFactor	n1		
}			
freqDomainPosition	0		
freqDomainShift	0		
freqHopping SEQUENCE {			
c-SRS	1		
b-SRS	0		
b-hop	0		
}			
groupOrSequenceHopping		NOT PRESENT	
}			
sequenceId	0		
spatialRelationInfo SEQUENCE {	SRS-SpatialRelationInfo		
servingCellId	Not present		
referenceSignal CHOICE {			
ssb-Index	SSB-Index		
}			
}			
}			
tpc-Accumulation	Not present		
}			

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

Derivation Path: TS 38.331 [6], clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
DRX-Config ::= CHOICE {			
drx-onDurationTimer CHOICE {			
milliSeconds	ms6		
}			
drx-InactivityTimer	ms1		
drx-HARQ-RTT-TimerDL	56		
drx-HARQ-RTT-TimerUL	56		
drx-RetransmissionTimerDL		sl1	
drx-RetransmissionTimerUL		sl1	
drx-LongCycleStartOffset CHOICE {			
ms320	0		
}			
shortDRX		NOT PRESENT	
drx-SlotOffset	0		
}			

Table 4.4.1.1.4.3-3: *UplinkConfigCommonSIB* : Additional test requirement for UE transmit timing accuracy Test 2 for EN-DC FR1

Derivation Path: TS 38.331 [6], clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
UplinkConfigCommonSIB SEQUENCE {			
frequencyInfoUL	FrequencyInfoUL-SIB		
initialUplinkBWP	BWP-UplinkCommon		
timeAlignmentTimerCommon	infinity		
}			

4.4.1.1.5 Test Requirements

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

Parameter		**Unit**	**Config**	**Test1**	**Test2**	**Band Group**
SSB ARFCN			1,2,3	Freq1	Freq1	
Duplex Mode			1	FDD		
			2,3	TDD		
TDD configuration			1`	Not Applicable		
			2	TDDConf.1.1		
			3	TDDConf.1.2		
$BW_{channel}$		MHz	1	10: NRB,c = 52		
			2	10: $N_{RB,c}$ = 52		
			3	40: $N_{RB,c}$ = 106		
BWP BW		MHz	1	10: NRB,c = 52		
			2	10: $N_{RB,c}$ = 52		
			3	40: $N_{RB,c}$ = 106		
DRx Cycle		ms	1,2,3	N/A	320[Note5]	
PDSCH Reference measurement channel			1	SR.1.1 FDD		
			2	SR.1.1 TDD		
			3	SR.2.1 TDD		
CORESET Reference Channel			1	CR.1.1 FDD		
			2	CR.1.1 TDD		
			3	CR.2.1 TDD		
OCNG Patterns			1,2,3	OCNG pattern 1		
SMTC configuration			1,2	FR1 pattern 1		
			3	FR1 pattern 2		

PDSCH/PDCCH subcarrier spacing		kHz	1,2	15		
			3	30		
EPRE ratio of PSS to SSS		dB	1,23	0	0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15 kHz	1,2,3	-98	-98	
N_{oc} Note2		dBm/SCS	1,2	-98	-98	
			3	-95	-95	
$\hat{E}_s/I_{ot}$			1,2,3	3	3	
$\hat{E}_s/N_{oc}$			1,2,3	3	3	
SS-RSRP Note3		dBm/SCS	1,2	-95	-95	
			3	-92	-92	
Io Note3		dBm/9.36MHz	1,2	-65.2	-65.2	
		dBm/38.1MHz	3	-59.2	-59.2	
Propagation condition			1,2,3	AWGN		
SRS Config			1,2,3	Config1 Note6	Config2 Note6	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: DRx related parameters are given in Table A.4.4.1.1.1-4
Note 6: SRS configs are given in Table A.4.4.1.1.1-3

Table 4.4.1.1.5-2 SRS Configuration for Timing Accuracy Test

	Field	Config1	Config 2	Comments
SRS-ResourceSet	srs-ResourceSetId	0	0	
	srs-ResourceIdList	0	0	
	resourceType	Periodic	Periodic	
	Usage	Codebook	Codebook	
	SRS-ResourceSetId	0	0	
SRS-Resource	nrofSRS-Ports	Port1	Port1	
	transmissionComb	n2	n2	
	combOffset-n2	0	0	
	cyclicShift-n2	0	0	
	resourceMapping startPosition	0	0	
	resourceMapping nrofSymbols	n1	n1	
	resourceMapping	n1	n1	

	repetitionFactor			
	freqDomainPosition	0	0	
	freqDomainShift	0	0	
	freqHopping c-SRS	sl1	sl1	
	freqHopping b-SRS	0	0	
	freqHopping b-hop	0	0	
	groupOrSequenceHopping	Neither	Neither	
	resourceType	Periodic	Periodic	
	periodicityAndOffset-p	sl1	sl640	Offset to align with DRx periodicity
	sequenceId	0	0	Any 10 bit number

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

Field	Test 2
	Value
drx-onDurationTimer	6 ms
drx-InactivityTimer	1 ms
drx-RetransmissionTimerDL	1 slot
drx-RetransmissionTimerUL	1 slot
longDRX-CycleStartOffset	320 ms
shortDRX	disable
TimeAlignmentTimer	Infinity
Note: The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [13]	

Table 4.4.1.1.5-4: T_e Timing Error Limit

Frequency Range	SCS of SSB signals (KHz)	SCS of uplink signals s(KHz)	T_e
1	15	15	13.75*64*T_c
		30	11.75*64*T_c
		60	11.75*64*T_c
	30	15	9.75*64*T_c
		30	9.75*64*T_c
		60	8.75*64*T_c
Note 1: T_c is the basic timing unit defined in TS 38.211 [6]			

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

Frequency Range	SCS of uplink signals (KHz)	T_q	T_p
1	15	5.5*64*T_c	5.5*64*T_c
	30	5.5*64*T_c	5.5*64*T_c
	60	5.5*64*T_c	5.5*64*T_c
NOTE 1: T_c is the basic timing unit defined in TS 38.211 [6]			

4.4.2 UE timer accuracy

4.4.3 Timing advance

4.4.3.0 Minimum conformance requirements

4.4.3.0.1 Minimum conformance requirements for timing advance adjustment accuracy

The timing advance is initiated from gNB with MAC message that implies and adjustment of the timing advance, as defined in clause 5.2 of TS 38.321 [12].

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 4.4.3.0.3-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS38.213 [8].

Table 4.4.3.0.3-1: UE Timing Advance adjustment accuracy

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

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

4.4.3.1 EN-DC FR1 timing advance adjustment accuracy

Editor's Notes: The RMC for PDCCH in TS 38.133 contains square brackets

4.4.3.1.1 Test purpose

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

4.4.3.1.2 Test applicability

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

4.4.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 4.4.3.0.1.

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

4.4.3.1.4 Test description

4.4.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 and Table 5.3.6-1 of 38.521-1 [17].

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

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

Test Case ID	Description

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

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

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

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

Table 4.4.3.1.4.1-3: General test parameters for timing advance

Parameter	Unit	Value	Comment
RF channel number		Cell 1: 1 Cell 2: 2	1 for E-UTRAN Pcell 2 for NR PSCell
DL BWP		DLBWP.1.1	As specified in Table A.3.9.2.1-1 & Table A.3.9.2.2-1
UL BWP		ULBWP.1.1	As specified in Table A.3.9.3.1-1 & Table A.3.9.3.2-1
Timing Advance Command (T_A) value during T1		31	$N_{TA\_new} = N_{TA\_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2
Timing Advance Command (T_A) value during T2		39	$N_{TA\_new} = N_{TA\_old} + 8192*T_c$ (based on equation in TS38.213 section 4.2)
T1	S	5	
T2	S	5	

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

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

4.4.3.1.4.2 Test Procedure

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

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Message content are defined in clause 4.4.3.1.2.3.

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

3. SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message.

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

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

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

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

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

10. The result from the SRS and adjustment of the timing advance in step 7) is used to measure that the UE adjusts the timing of its transmission with a relative accuracy better than or equal to value specified in Table 4.4.3.1.3-1 to the signalled timing advance value compared to the timing of preceding uplink transmission.

11. If the UE adjust the timing of its transmission within a relative accuracy greater than or equal to value specified in Table 4.4.3.1.3-1 to the signalled timing advance value compared to the timing of preceding uplink transmission then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

12. The SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

13. After the RRC connection release, the SS:

    - [transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE is in RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5]

    or

    - [if the paging fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5].

14. Repeat step 3-13 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.4.3.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1, with exceptions listed below in the Table 4.4.3.1.4.3-1

Table 4.4.3.1.4.3-1: srs-Config setup

Derivation Path: TS 38.508-1, Table 4.6.3-135			
Information Element	**Value/remark**	**Comment**	**Condition**
SRS-Config ::= SEQUENCE {			
srs-ResourceSetToReleaseList	Not present		
srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE {	[1 entry]		
}			
resourceType CHOICE {			
periodic SEQUENCE {			
}			
}			
Usage	nonCodebook		
pathlossReferenceRS CHOICE {			
ssb-Index	SSB-Index		
}			
srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE {	1 entry		
srs-ResourceId	0		
nrofSRS-Ports	port1		
transmissionComb CHOICE {			
n2 SEQUENCE {			
combOffset-n2	0		
cyclicShift-n2	0		
}			
}			
resourceMapping SEQUENCE {			
startPosition	0		
nrofSymbols	n1		
repetitionFactor	n1		
}			
freqDomainPosition	0		
freqDomainShift	0		
freqHopping SEQUENCE {			
c-SRS	12	Config 1,2,4,5	
	24	Config 3,6	
b-SRS	0		
b-hop	0		
}			
groupOrSequenceHopping	neither		
resourceType CHOICE {			
periodic SEQUENCE {	periodic		
}			
periodicityAndOffset-p	sl5 : 0	Once every 5 Slots	
}			
}			
}			

4.4.3.1.5 Test Requirement

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

k = 4 for Config 1, 2, 4, 5, and

k = 7 for Config 3, 6

The Timing Advance adjustment accuracy for PSCell in sTAG shall be within the limits specified in clause 7.3.2.2.

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

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

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

Parameter	Unit	Test1	
		T1	T2

Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.2.1
$BW_{channel}$	Config 1,4	MHz	10: $N_{RB,c}$ = 52
	Config 2,5		10: $N_{RB,c}$ = 52
	Config 3,6		40: $N_{RB,c}$ = 106
BWP BW	Config 1,4	MHz	10: $N_{RB,c}$ = 52
	Config 2,5		10: $N_{RB,c}$ = 52
	Config 3,6		40: $N_{RB,c}$ = 106
DRx Cycle		ms	Not Applicable
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2,5		SR.1.1 TDD
	Config 3,6		SR2.1 TDD
CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2,5		CR.1.1 TDD
	Config 3,6		CR2.1 TDD
OCNG Patterns			OCNG pattern 1
TRS configuration	Config 1,4		TRS.1.1 FDD
	Config 2,5		TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD
SMTC configuration	Config 1,2,4,5		SMTC.1 FR1
	Config 3,6		SMTC.2 FR1
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5	kHz	15 kHz
	Config 3,6		30 kHz
PUCCH/PUSCH subcarrier spacing	Config 1,2,4,5	kHz	15 kHz
	Config 3,6		30 kHz
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
N_{oc} Note2		dBm/15kHz	-98
N_{oc} Note2	Config 1,2,4,5	dBm/SCS	-98
	Config 3,6		-95
$\hat{E}_s/I_{ot}$		dB	3
$\hat{E}_s/N_{oc}$		dB	3
Io Note3	Config 1,2,4,5	dBm/ 9.36MHz	-67.57
	Config 3,6	dBm/ 38.16MHz	-62.58
Propagation condition		-	AWGN

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

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

Field		Value	Comment
c-SRS	Config 1,2,4,5	12	Frequency hopping is disabled
	Config 3,6	24	
b-SRS		0	
b-hop		0	
freqDomainPosition		0	Frequency domain position of SRS
freqDomainShift		0	
groupOrSequenceHopping		neither	No group or sequence hopping
SRS-PeriodicityAndOffset		sl5=0	Once every 5 slots
pathlossReferenceRS		ssb-Index=0	SSB #0 is used for SRS path loss estimation
Usage		nonCodebook	Non-codebook based UL transmission
startPosition		0	resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition.
nrofSymbols		n1	
repetitionFactor		n1	
combOffset-n2		0	transmissionComb setting
cyclicShift-n2		0	
nrofSRS-Ports		port1	Number of antenna ports used for SRS transmission
Note: For further information see clause 6.3.2 in TS 38.331.			

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

4.5 Signaling characteristics

4.5.1 Radio link monitoring

The UE shall monitor the downlink link quality based on the reference signal in the configured RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell and PSCell as specified in [3]. The configured RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP.

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

The threshold Q_{out} is defined as the level at which the downlink radio link cannot be reliably received and shall correspond to the out-of-sync block error rate ($BLER_{out}$) as defined in Table 4.5.1-1. For SSB based radio link monitoring, Q_{out_SSB} is derived based on the hypothetical PDCCH transmission parameters listed in Table 4.5.1.1.4.1-3. For CSI-RS based radio link monitoring, Q_{out_CSI-RS} is derived based on the hypothetical PDCCH transmission parameters listed in Table [4.x.x.x-x].

The threshold Q_{in} is defined as the level at which the downlink radio link quality can be significantly more reliably received than at Q_{out} and shall correspond to the in-sync block error rate ($BLER_{in}$) as defined in Table 4.5.1-1. For SSB based radio link monitoring, Q_{in_SSB} is derived based on the hypothetical PDCCH transmission parameters listed in Table 4.5.1.1.4.1-3. For CSI-RS based radio link monitoring, Q_{in_CSI-RS} is derived based on the hypothetical PDCCH transmission parameters listed in Table [4.x.x.x-x]

The out-of-sync block error rate ($BLER_{out}$) and in-sync block error rate ($BLER_{in}$) are determined from the network configuration via parameter *rlmInSyncOutOfSyncThreshold* signalled by higher layers. When UE is not configured with *RLM-IS-OOS-thresholdConfig* from the network, UE determines out-of-sync and in-sync block error rates from Configuration #0 in Table 4.5.1-1 as default. All requirements here are applicable for BLER Configuration #0 in Table 4.5.1-1.

Table 4.5.1-1: Out-of-sync and in-sync block error rates

Configuration	$BLER_{out}$	$BLER_{in}$
0	10%	2%

UE shall be able to monitor up to $X_{RLM\text{-}RS}$ RLM-RS resources of the same or different types in each corresponding carrier frequency range, where $X_{RLM\text{-}RS}$ is specified in Table 4.5.1-2, and meet the requirements as specified in this section.

Table 4.5.1-2: Maximum number of RLM-RS resources $X_{RLM\text{-}RS}$

Maximum number of RLM-RS resources, $X_{RLM\text{-}RS}$	Carrier frequency range of PCell/PSCell
2	FR1, ≤ 3 GHz
4	FR1, > 3 GHz
8	FR2

If different SCS is used for CSI-RS based RLM-RS and SSB, then CSI-RS based RLM-RS and SSB shall be TDMed. If same SCS is used for CSI-RS based RLM-RS and SSB, then CSI-RS based RLM-RS and SSB can be FDMed or TDMed.

Any uplink signal transmitted by the UE is used for detecting the In-/Out-of-Sync state of the UE. In terms of measurement, the uplink signal is verified on the basis of the UE output power:

For intra-band contiguous carrier aggregation, transmit OFF power is measured as the mean power per component carrier.

For UE with multiple transmit antennas, transmit OFF power is measured as the mean power at each transmit connector.

- UE output power higher than Transmit OFF power [-50] dBm (as defined in TS 38.101-3 [TBD]) means uplink signal
- UE output power equal to or less than Transmit OFF power [-50] dBm (as defined in TS 38.101-3 [TBD]) means no uplink signal.

4.5.1.0 Minimum conformance requirements

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

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

$T_{Evaluate\_out\_SSB}$ is defined in Table 4.5.1.0.1-1 for FR1.

Table 4.5.1.0.1-1: Evaluation period $T_{Evaluate\_out}$ for FR1

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

For FR1,

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

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

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

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

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

The out-of-sync and in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [8]. Two successive indications from Layer 1 shall be separated by at least $T_{Indication\_interval}$.

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

When

- the UE transitions from a first configuration of RLM-RS resources to a second configuration of RLM-RS resources that is different from the first configuration,

or

- the UE transitions between DRX and no DRX or DRX cycle periodicity changes,

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

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

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

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

There are no scheduling restrictions due to radio link monitoring performed with a same subcarrier spacing as PDSCH/PDCCH on FR1.

For UE which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to radio link monitoring based on SSB as RLM-RS. For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [11] the following restrictions apply due to radio link monitoring based on SSB as RLM-RS.

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on SSB symbols to be measured for radio link monitoring.

The normative reference for this requirement is TS 38.133 [6] clauses 8.1.2, 8.1.4, 8.1.5, 8.1.6 and 8.1.7.

4.5.1.0.2 Minimum conformance requirements for in-sync SSB-based RLM

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

$T_{Evaluate\_out\_SSB}$ and $T_{Evaluate\_in\_SSB}$ are defined in Table 4.5.1.0.2-1 for FR1.

For FR1,

- P=1/(1 – T_{SSB}/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

If the high layer in TS 38.331 [2] signaling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

Note: The overlap between CSI-RS RLM and SMTC means that CSI-RS based RLM is within the SMTC window duration.Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

The values of M_{out} and M_{in} used in Table 4.5.1.2.3-1 are defined as:

- M_{out} = 20 and M_{in} = 10, if the CSI-RS resource configured for RLM is transmitted with Density =3.

Table 4.5.1.0.2-1: Evaluation period $T_{Evaluate\_out}$ and $T_{Evaluate\_in}$ for FR1

Configuration	$T_{Evaluate\_out}$ (ms)	$T_{Evaluate\_in}$ (ms)
no DRX	max(200, ceil(M_{out}×P)×T_{CSI-RS})	max(100, ceil(M_{in}×P) × T_{CSI-RS})
DRX ≤ 320ms	max(200, ceil(1.5×M_{out}×P)× max(T_{DRX}, T_{CSI-RS}))	max(100, ceil(1.5×M_{in}×P)× max(T_{DRX}, T_{CSI-RS}))
DRX > 320ms	ceil(M_{out}×P) × T_{DRX}	ceil(M_{in}×P) × T_{DRX}
NOTE: T_{CSI-RS} is the periodicity of CSI-RS resource configured for RLM. T_{DRX} is the DRX cycle length.		

If the high layer in TS 38.331 [2] signaling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than Q_{in}, Layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [2].

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

When DRX is not used $T_{Indication\_interval}$ is max(10ms, $T_{RLM-RS,M}$), where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to T_{SSB} specified in section 8.1.2 of TS 38.133 [6] if the RLM-RS resource is SSB, or T_{CSI-RS} specified later in this if the RLM-RS resource is CSI-RS.

When DRX is used, TIndication_interval is max(10ms, 1.5*DRX_cycle_length, 1.5*TRLM-RS,M) if DRX cycle_length is less than or equal to 320ms, and TIndication_interval is DRX_cycle_length if DRX cycle_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [2], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

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

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

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

There are no scheduling restrictions due to radio link monitoring performed with a same subcarrier spacing as PDSCH/PDCCH on FR1.

For UE which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to radio link monitoring based on SSB as RLM-RS. For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [11] the following restrictions apply due to radio link monitoring based on SSB as RLM-RS.

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on SSB symbols to be measured for radio link monitoring.

The normative reference for this requirement is TS 38.133 [6] clauses 8.1.2, 8.1.4, 8.1.5, 8.1.6, 8.1.7 and A.7.5.1.

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

[TS 38.133 clause 8.1.3.2]

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

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

- $T_{Evaluate\_out\_CSI-RS}$ and $T_{Evaluate\_in\_CSI-RS}$ are defined in Table 8.1.3.2-1 for FR1.

For FR1,

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

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

If the high layer in TS 38.331 [2] signaling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

Note: The overlap between CSI-RS RLM and SMTC means that CSI-RS based RLM is within the SMTC window duration. Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

The values of M_{out} and M_{in} used in Table 8.1.3.2-1 are defined as:

- M_{out} = 20 and M_{in} = 10, if the CSI-RS resource configured for RLM is transmitted with Density =3.

Table 4.5.1.0.3-1: Evaluation period $T_{Evaluate\_out}$ and $T_{Evaluate\_in}$ for FR1

Configuration	$T_{Evaluate\_out}$ (ms)	$T_{Evaluate\_in}$ (ms)
no DRX	max(200, ceil(M_{out}×P)×T_{CSI-RS})	max(100, ceil(M_{in}×P) × T_{CSI-RS})
DRX ≤ 320ms	max(200, ceil(1.5×M_{out}×P)× max(T_{DRX}, T_{CSI-RS}))	max(100, ceil(1.5×M_{in}×P)× max(T_{DRX}, T_{CSI-RS}))
DRX > 320ms	ceil(M_{out}×P) × T_{DRX}	ceil(M_{in}×P) × T_{DRX}
NOTE: T_{CSI-RS} is the periodicity of CSI-RS resource configured for RLM. T_{DRX} is the DRX cycle length.		

[TS 38.133 clause 8.1.6]

When the downlink radio link quality on all the configured RLM-RS resources is worse than Q_{out}, Layer 1 of the UE shall send an out-of-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 38.331 [2].

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than Q_{in}, Layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [2].

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

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

In case DRX is used, $T_{Indication\_interval}$ is max(10ms, 1.5*DRX_cycle_length, 1.5*$T_{RLM-RS,M}$) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication\_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [2], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

[TS 38.133 clause 8.1.5]

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331 [2].

The normative reference for this requirement is TS 38.133 [6] clause 8.1.3.2, 8.1.6 and 8.1.5.

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

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Connection diagram is TBD

-Initial Conditions has some TBD

-Test Requirement has some TBD

- Message Exceptions is FFS

4.5.1.1.1 Test purpose

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

4.5.1.1.2 Test applicability

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

4.5.1.1.3 Minimum conformance requirement

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

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

4.5.1.1.4 Test description

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

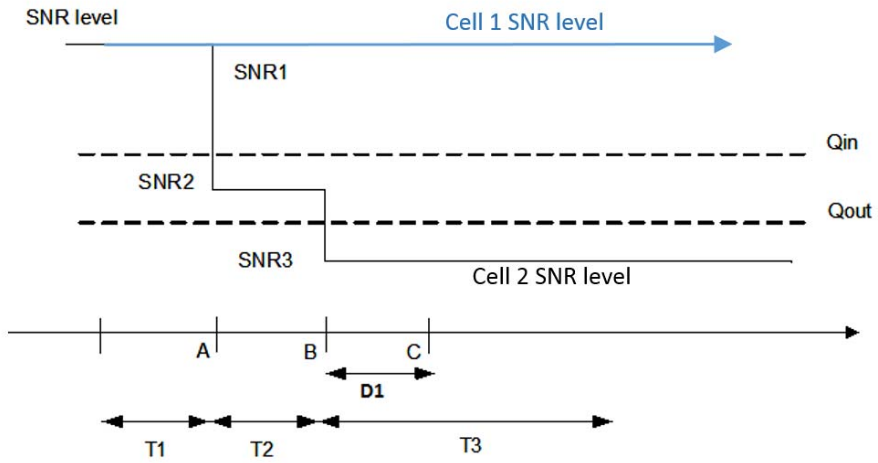


Figure 4.5.1.1.4-1: SNR variation for out-of-sync testing

4.5.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table [5.3.5-1] and Table [5.3.6-1] of 38.521-1 [17].

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

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

Test Case ID	Description
4.5.1.1.4.1-1	LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.1.1.4.1-2	LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.1.1.4.1-3	LTE FDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.1.1.4.1-4	LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.1.1.4.1-5	LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.1.1.4.1-6	LTE TDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

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

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

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.1.1.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

PDCCH transmission parameters are given in Table 4.5.1.1.4.1-3

Table 4.5.1.1.4.1-3: PDCCH transmission parameters for out-of-sync

Attribute	Value for BLER Configuration #0
DCI format	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	8
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	4dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	4dB
Bandwidth (MHz)	TBD
Sub-carrier spacing (kHz)	TBD
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

1. Message contents are defined in clause 4.5.1.1.4.3.

2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2

3. The test parameters are given in Table 4.5.1.1.4.1-4 below.

4. Downlink signals for NR cell are initially set up according to Annex [C.0], [C.1], [C.2], [C.3.1] and uplink signals according to Annex [G.0], [G.1], [G.2], [G.3.1].

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

Parameter		Unit	Value	
			Test 1	Test 2
Active E-UTRA PCell			Cell 1	Cell 1
E-UTRA RF Channel Number			1	1
Active PSCell			Cell 2	Cell 2
RF Channel Number			2	2
Duplex mode	Config 1, 4		FDD	FDD
	Config 2, 3, 5, 6		TDD	TDD
TDD Configuration	Config 1, 4		Not Applicable	Not Applicable
	Config 2, 5		[TDDConf.1.1]	[TDDConf.1.1]
	Config 3, 6		[TDDConf.1.2]	[TDDConf.1.2]
CORESET Reference Channel	Config 1, 4		[CR. 1.1 FDD]	[CR. 1.1 FDD]
	Config 2, 5		[CR. 1.1 TDD]	[CR. 1.1 TDD]
	Config 3, 6		[CR. 2.1 TDD]	[CR. 2.1 TDD]
SSB Configuration	Config 1, 4		[Table A.3.2.2.1.1-1]	[Table A.3.2.2.1.1-1]
	Config 2, 5		[Table A.3.2.2.1.1-1]	[Table A.3.2.2.1.1-1]
	Config 3, 6		[Table A.3.2.2.1.2-1]	[Table A.3.2.2.1.2-1]
SMTC Configuration	Config 1, 2, 4, 5		[Table A.3.2.3.1-1]	[Table A.3.2.3.1-1]
	Config 3, 6		[Table A.3.2.3.1-1]	[Table A.3.2.3.1-1]
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5		15 KHz	15 KHz
	Config 3, 6		30 KHz	30 KHz
PRACH Configuration	Config 1, 2, 4, 5		TBD	TBD
	Config 3, 6		TBD	TBD
SSB index assigned as RLM RS			[0]	[0]
OCNG parameters			[Table A.3.2.1.1-1]	[Table A.3.2.1.1-1]
CP length			Normal	Normal
Correlation Matrix and Antenna Configuration			[2x2 Low]	[2x2 Low]
Out of sync transmission parameters	DCI format		1-0	1-0
	Number of Control OFDM symbols		2	2
	Aggregation level	CCE	8	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4	4
	DMRS precoder granularity		REG bundle size	REG bundle size
	REG bundle size		6	6
DRX			*OFF*	*OFF*
Gap pattern ID			[N.A.]	*[gp0]
Layer 3 filtering			*Enabled*	*Enabled*
T310 timer		ms	*0*	*0*
T311 timer		ms	1000	1000
N310			1	1
N311			1	1
NZP CSI-RS configuration			TBD	TBD
ZP CSI-RS configuration			TBD	TBD
CSI-IM configuration			TBD	TBD
Periodic CSI reporting			PUCCH	PUCCH
CSI reporting periodicity	Config 1, 2, 4, 5	slot	[5]	[5]
	Config 3, 6		[10]	[10]
T1		s	1	1

T2	s	0.4	0.4
T3	s	[0.6]	[0.6]
D1	s	[0.24]	[0.44]
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts. Note 3: E-UTRAN is in non-DRX mode under test.			

4.5.1.1.4.2 Test Procedure

The test consists of two cells, a single E-UTRA cell (Pcell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 1] with a reporting periodicity as mentioned in the above table 4.5.1.1.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [6] clause 4.5.

2. Set the parameters according to T1 in Table 4.5.1.1.4.4-1 for subtest 1 and 2. Propagation conditions are set according to Annex TBD. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.1.4.4-1 for subtests 1 and 2. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.1.4.4-1 for subtests 1 and 2. T3 starts.

5. If the SS:

   a) detects uplink power equal to or higher than [-50 dBm] in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 1]) during the period from time point A to time point B

   and

   b) does not detect any uplink power higher than [-50 dBm] from time point C (240 ms after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

6. Otherwise the number of failed tests is increased by one.

7. When T3 expires the SS shall change the SNR value to T1 as specified in Table 4.5.1.1.4.4-1 for subtests 1 and 2.

8. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [6] clause 4.5.

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

4.5.1.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1.

Table yy: message exceptions for NSA

FFS

4.5.1.1.4.4 Test Requirement

Table 4.5.1.1.4.4-1 defines the cell specific primary level settings.

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

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

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

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

Table 4.5.1.1.4.4-1: Cell specific test parameters for FR1 (Cell 2) for out-of-sync radio link monitoring tests in non-DRX mode

Parameter		Unit	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
PDCCH_beta		dB	4			4		
PDCCH_DMRS_beta		dB	4			4		
PBCH_beta		dB	0			0		
PSS_beta		dB						
SSS_beta		dB						
PDSCH_beta		dB						
OCNG_beta		dB						
SNR	Config 1, 4	dB	[1]	[-7]	[-15]	[1]	[-7]	[-15]
	Config 2, 5		[1]	[-7]	[-15]	[1]	[-7]	[-15]
	Config 3, 6		[1]	[-7]	[-15]	[1]	[-7]	[-15]
N_{oc}	Config 1, 4	dBm/15KHz	[-98]			[-98]		
	Config 2, 5		[-98]			[-98]		
	Config 3, 6		[-98]			[-98]		
Propagation condition			[TDL-C 300ns 100Hz]			[TDL-C 300ns 100Hz]		

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 4.5.1.1.1-1.
Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table 4.5.1.1.4.4-2: Measurement gap configuration for out-of-sync tests in non-DRX mode

Field	Test 2
	Value
gapOffset	[0]

Note 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM RS is partially overlapped with measurement gap).

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

Editor's Notes: This test case is incomplete. The following aspects are either missing or not yet determined

- Initial Conditions has some TBD due to Annexes still being in formative stage.

- Several test configurations are in square brackets pending RAN4 updates.

- Test tolerance analysis is TBD
- Exceptions to Message contents are TBD
- Cell mapping is TBD
- Connection diagram is TBD
- whether to revise the SSB configuration to be 2 SSBs and FFS the corresponding power level

4.5.1.2.1 Test purpose

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

4.5.1.2.2 Test applicability

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

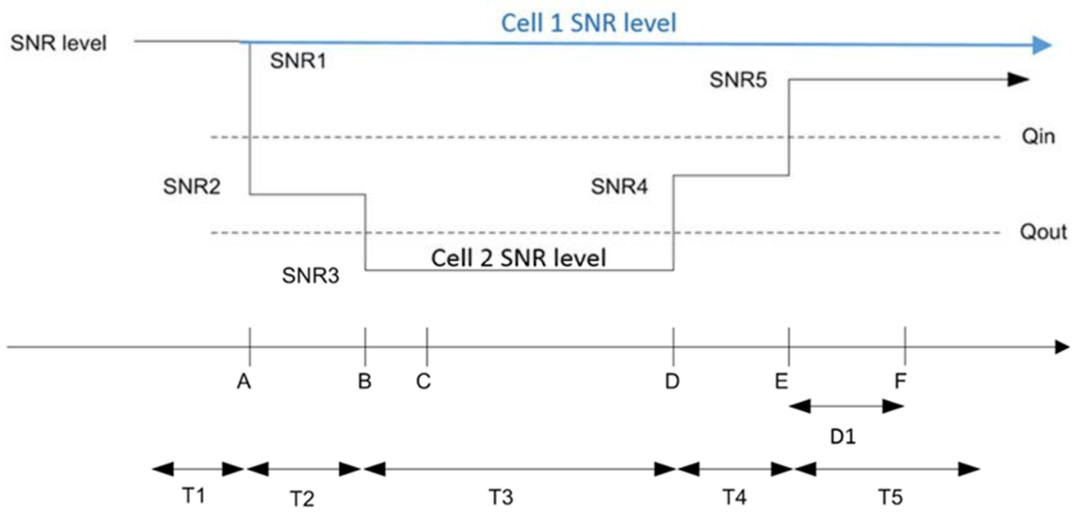
4.5.1.2.3 Minimum conformance requirements

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

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

4.5.1.2.4 Test description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.1.2.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [5] ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.



Figuer 4.5.1.2.4-1: SNR variation for in-sync testing

4.5.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table [5.3.5-1] and Table [5.3.6-1] of 38.521-1 [17].

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

Table 4.5.1.2.4.1-1: Supported test configurations for FR1 PSCell

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

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

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

<table>
<tr><th>Parameter</th><th colspan="2">Value</th><th>Comment</th></tr>
<tr><td>Test environment</td><td colspan="2">NC</td><td>As specified in TS 38.508-1 [14] clause 4.1.</td></tr>
<tr><td>Test frequencies</td><td colspan="3">As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.</td></tr>
<tr><td>Channel bandwidth</td><td colspan="3">As specified by the test configuration selected from Table 4.5.1.2.5-1</td></tr>
<tr><td>Propagation conditions</td><td colspan="2">AWGN</td><td>As specified in Annex C.2.2.</td></tr>
<tr><td rowspan="2">Connection Diagram</td><td>TE Part</td><td>A.3.TBD</td><td rowspan="2">As specified in TS 38.508-1 [14] Annex A.</td></tr>
<tr><td>DUT Part</td><td>A.3.TBD</td></tr>
<tr><td>Exceptions to connection diagram</td><td colspan="2">N/A</td><td></td></tr>
</table>

PDCCH transmission parameters are given in Table 4.5.1.2.4.1-3.

Table 4.5.1.2.4.1-3: PDCCH transmission parameters for in-sync

Attribute	Value for BLER Configuration #0
DCI payload size	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	4
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	0dB
Bandwidth (MHz)	TBD
Sub-carrier spacing (kHz)	TBD
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

1. Message contents are defined in clause 4.5.1.3.4.3.

2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2

3. The general test parameters are given in Table 4.5.1.2.5-4 below.

4. Downlink signals for NR cell are initially set up according to Annex [C.0], [C.1], [C.2], [C.3.1] and uplink signals according to Annex [G.0], [G.1], [G.2], [G.3.1].

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

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
$BW_{channel}$	Config 1, 4	MHz	10: $N_{RB,c}$ = 52
	Config 2, 5		10: $N_{RB,c}$ = 52
	Config 3, 6		40: $N_{RB,c}$ = 106
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1
TDD Configuration	Config 1, 4		Not Applicable
	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1
CORESET Reference Channel	Config 1, 4		CR.1.1 FDD
	Config 2, 5		CR.1.1 TDD
	Config 3, 6		CR.2.1 TDD
SSB Configuration	Config 1, 4		SSB.1 FR1
	Config 2, 5		SSB.1 FR1
	Config 3, 6		SSB.2 FR1
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1
	Config 3, 6		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5		15 KHz
	Config 3, 6		30 KHz
PRACH Configuration	Config 1, 2, 4, 5		Table A.3.8.2.4-1
	Config 3, 6		Table A.3.8.2.4-1
SSB index assigned as RLM RS			0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4

	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			*OFF*
Gap pattern ID			N.A.
Layer 3 filtering			*Enabled*
T310 timer		ms	2000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1, 4		[CSI-RS.1.3 FDD]
	Config 2, 5		[CSI-RS.1.3 TDD]
	Config 3, 6		[CSI-RS.2.3 TDD]
T1		s	0.5
T2		s	0.4
T3		s	1.46
T4		s	0.4
T5		s	1
D1		s	0.42
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts. Note 3: E-UTRAN is in non-DRX mode under test.			

4.5.1.2.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (Pcell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 1] with a reporting periodicity as mentioned in the above table 4.5.1.2.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [6] clause 4.5.

2. Set the parameters according to T1 in Table 4.5.1.2.4-1 for subtest 1 and 2. Propagation conditions are set according to Annex TBD. T1 starts.

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

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

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

6. When T4 expires, the SS shall change the SNR value to T3 as specified in Table 4.5.1.2.5-1. T5 starts.

7. If the SS detects uplink power equal to or higher than -39 dBm in the On-duration part of every DRX cycle in the subframe according the configured CQI reporting mode (PUCCH 1-0) during the period from time point A to time point F (1120 ms after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

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

4.5.1.2.4.3 Message Contents

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

Table 4.5.1.2.4.3-1: Common Exception messages for EN-DC FR1 Radio Link Monitoring In-Sync Test for FR1 PSCell configured with SSB-based RLM RS in non-DRX mode

TBD

4.5.1.2.5 Test Requirement

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

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

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

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

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

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

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	4				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0				
EPRE ratio of PBCH DMRS to SSS		dB	0				
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR	Config 1, 4	dB	1	-7	-15	-4.5	1
	Config 2, 5		1	-7	-15	-4.5	1
	Config 3, 6		1	-7	-15	-4.5	1
N_{oc}	Config 1, 4	dBm/15 KHz	-98				
	Config 2, 5		-98				
	Config 3, 6		-98				
Propagation condition			TDL-C 300ns 100Hz				
Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG. Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs. Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.4.5.1.2.1-1. Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in section A.3.6.							

Table 4.5.1.2.5-2: TimeAlignmentTimer -Configuration for in-sync testing

Field		Test 1
		Value
TimeAlignmentTimer		infinity
periodicityAndOffset in SchedulingRequestResourceConfig	Config 1, 2, 4, 5	[sl5]
	Config 3, 6	[sl10]

Table 4.5.1.2.5-3: Measurement gap configuration for in-sync tests in non-DRX mode

Field	Test 2
	Value

gapOffset	[TBD]
Note 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM RS is partially overlapped with measurement gap).	

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

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Connection diagram is TBD

-Initial Conditions has some TBD

-Test Requirement has some TBD

- Message Exceptions is FFS

4.5.1.3.1 Test purpose

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

4.5.1.3.2 Test applicability

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

4.5.1.3.3 Minimum conformance requirement

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

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

4.5.1.3.4 Test description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1 as defined in 38.133 [6]. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.4.5.1.3.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [5] ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test

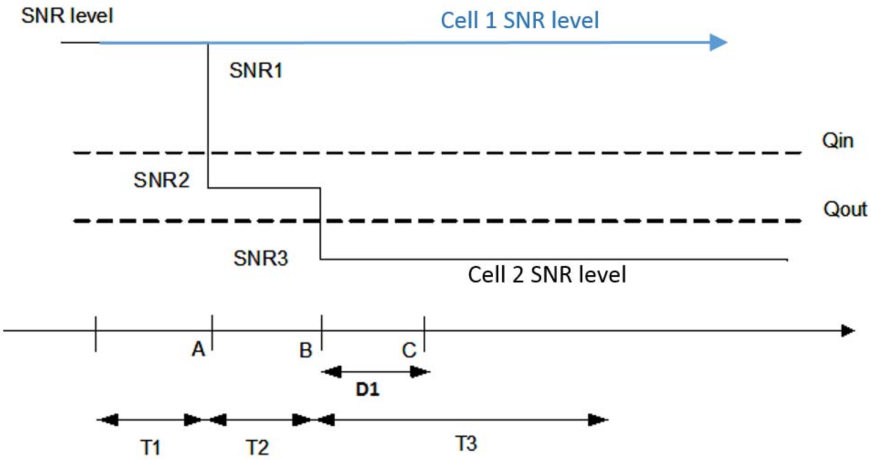


Figure 4.5.1.3.4-1: SNR variation for out-of-sync testing

4.5.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table [5.3.5-1] and Table [5.3.6-1] of 38.521-1 [17].

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

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

Test Case ID	Description
4.5.1.3.4.1-1	LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.1.3.4.1-2	LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.1.3.4.1-3	LTE FDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.1.3.4.1-4	LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.1.3.4.1-5	LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.1.3.4.1-6	LTE TDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

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

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

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.1.3.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

PDCCH transmission parameters are given in Table 4.5.1.3.4.1-3

Table 4.5.1.3.4.1-3: PDCCH transmission parameters for out-of-sync

Attribute	Value for BLER Configuration #0
DCI format	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	8
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	4dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	4dB
Bandwidth (MHz)	TBD
Sub-carrier spacing (kHz)	TBD
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

1. Message contents are defined in clause 4.5.1.3.4.3.
2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2
3. The test parameters are given in Table 4.5.1.3.4.1-4 below.
4. Downlink signals for NR cell are initially set up according to Annex [C.0], [C.1], [C.2], [C.3.1] and uplink signals according to Annex [G.0], [G.1], [G.2], [G.3.1].

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

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
TDD Configuration	Config 1, 4		Not Applicable
	Config 2, 5		[TDDConf.1.1]
	Config 3, 6		[TDDConf.1.2]
CORESET Reference Channel	Config 1, 4		[CR. 1.1 FDD]
	Config 2, 5		[CR. 1.1 TDD]
	Config 3, 6		[CR. 2.1 TDD]
SSB Configuration	Config 1, 4		Table A.3.2.2.1.1-1
	Config 2, 5		Table A.3.2.2.1.1-1
	Config 3, 6		Table A.3.2.2.1.2-1
SMTC Configuration	Config 1, 2, 4, 5		Table A.3.2.3.1-1
	Config 3, 6		Table A.3.2.3.1-1
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5		15 KHz
	Config 3, 6		30 KHz
PRACH Configuration	Config 1, 2, 4, 5		TBD
	Config 3, 6		TBD
SSB index assigned as RLM RS			[0]
OCNG parameters			Table A.3.2.1.1-1
CP length			Normal
Correlation Matrix and Antenna Configuration			[2x2 Low]
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX cycle		ms	640
Gap pattern ID			[N.A.]
Layer 3 filtering			*Enabled*
T310 timer		ms	*0*
T311 timer		ms	1000
N310			1
N311			1
NZP CSI-RS configuration			TBD
ZP CSI-RS configuration			TBD
CSI-IM configuration			TBD
Periodic CSI reporting			PUCCH
CSI reporting periodicity	Config 1, 2, 4, 5	slot	[5]
	Config 3, 6		[10]
T1		s	1
T2		s	0.4
T3		s	[7]
D1		s	[6.44]

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

4.5.1.3.4.2 Test Procedure

The test consists of two cells, a single E-UTRA cell (Pcell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 1] with a reporting periodicity as mentioned in the above table 4.5.1.3.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [6] clause 4.5.

2. Set the parameters according to T1 in Table 4.5.1.3.4.4-1 for subtest 1 and 2. Propagation conditions are set according to Annex TBD. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.3.4.4-1 for subtests 1 and 2. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.3.4.4-1 for subtests 1 and 2. T3 starts.

5. If the SS:

   a) detects uplink power equal to or higher than [-50 dBm] in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 1]) during the period from time point A to time point B

   and

   b) does not detect any uplink power higher than [-50 dBm] from time point C (240 ms after the start of T3) until T3 expires,
   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 4.5.1.3.4.4-1 for subtests 1 and 2.

7. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [6] clause 4.5.

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

4.5.1.3.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1.

Table 4.5.1.3.4.3 : message exceptions for NSA

FFS

4.5.1.3.4.4 Test Requirement

Table 4.5.1.3.4.4-1 defines the cell specific primary level settings.

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

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

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

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

Table 4.5.1.3.4.4-1: Cell specific test parameters for FR1 (Cell 2) for out-of-sync radio link monitoring tests in DRX mode

Parameter		Unit	Test 1		
			T1	T2	T3
PDCCH_beta		dB	4		
PDCCH_DMRS_beta		dB	4		
PBCH_beta		dB	0		
PSS_beta		dB			
SSS_beta		dB			
PDSCH_beta		dB			
OCNG_beta		dB			
SNR	Config 1, 4	dB	[1]	[-7]	[-15]
	Config 2, 5		[1]	[-7]	[-15]
	Config 3, 6		[1]	[-7]	[-15]
N_{oc}	Config 1, 4	dBm/15 KHz	[-98]		
	Config 2, 5		[-98]		
	Config 3, 6		[-98]		
Propagation condition			[TDL-C 300ns 100Hz]		

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 4.5.1.3.4-1.
Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table 4.5.1.3.4.4-2: DRX-Configuration for out-of-sync tests

Field	Test 1
	Value
drx-onDurationTimer	[ms6]
drx-InactivityTimer	[ms1]
drx-RetransmissionTimerDL	[sl1]
drx-RetransmissionTimerUL	[sl1]
longDRX-CycleStartOffset	[ms640]
shortDRX	disable

Table 4.5.1.3.4.4-3: TimeAlignmentTimer -Configuration for out-of-sync tests

Field		Test 1
		Value
TimeAlignmentTimer		infinity
periodicityAndOffset in SchedulingRequestResourceConfig	Config 1, 2, 4, 5	[sl5]
	Config 3, 6	[sl10]

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

Editor's Notes: This test case is incomplete. The following aspects are either missing or not yet determined

- Initial Conditions has some TBD due to Annexes still being in formative stage.

- Several test configurations are in square brackets pending RAN4 updates.

- Test tolerance analysis is TBD

- Exceptions to Message contents are TBD

- Cell mapping is TBD

- Connection diagram is TBD

- whether to revise the SSB configuration to be 2 SSBs and FFS the corresponding power level

4.5.1.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects in sync for the purpose of monitoring downlink radio link quality of the PSCell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in TS 38.133 [6] clause 8.1.2.

4.5.1.4.2 Test applicability

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

4.5.1.4.3 Minimum conformance requirements

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

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

4.5.1.4.4 Test Description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.1.4.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [5] ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

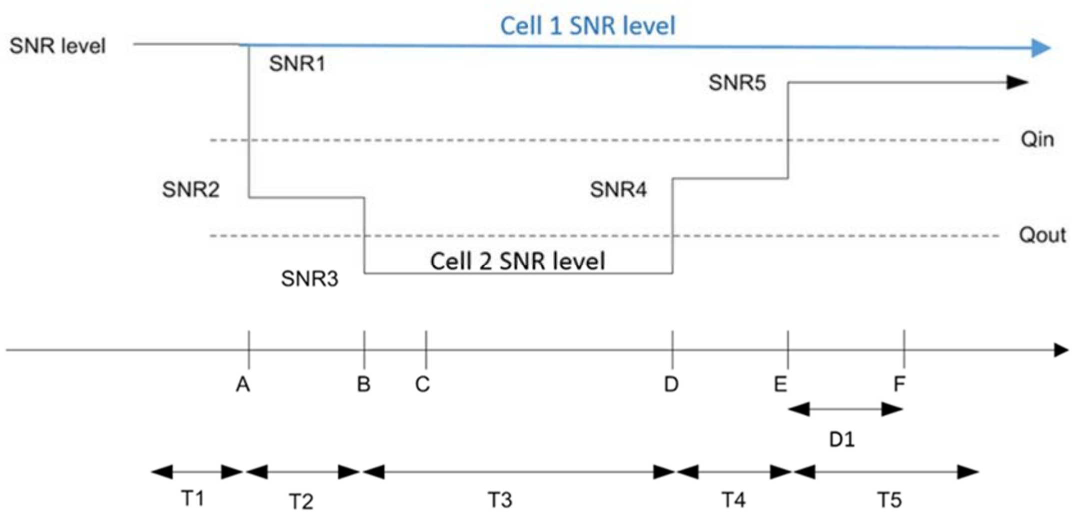


Table 4.5.1.4.4-1 - SNR variation for in-sync testing

4.5.1.4.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table [5.3.5-1] and Table [5.3.6-1] of 38.521-1 [17].

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

Table 4.5.1.4.4.1-1: Supported test configurations for FR1 PSCell

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

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

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

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.1.4.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

PDCCH transmission parameters are given in Table 4.5.1.4.4.1-3

Table 4.5.1.4.4.1-3: PDCCH transmission parameters for in-sync

Attribute	Value for BLER Configuration #0
DCI payload size	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	4
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	0dB
Bandwidth (MHz)	TBD
Sub-carrier spacing (kHz)	TBD
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

1. Message contents are defined in clause 4.5.1.3.4.3.
2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2
3. The general test parameters are given in Table 4.5.1.4.5-4 below.
4. Downlink signals for NR cell are initially set up according to Annex [C.0], [C.1], [C.2], [C.3.1] and uplink signals according to Annex [G.0], [G.1], [G.2], [G.3.1].

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

Parameter		Unit	Value Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
$BW_{channel}$	Config 1, 4	MHz	10: $N_{RB,c}$ = 52
	Config 2, 5		10: $N_{RB,c}$ = 52
	Config 3, 6		40: $N_{RB,c}$ = 106
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1
TDD Configuration	Config 1, 4		Not Applicable
	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1
CORESET Reference Channel	Config 1, 4		CR.1.1 FDD
	Config 2, 5		CR.1.1 TDD
	Config 3, 6		CR.2.1 TDD
SSB Configuration	Config 1, 4		SSB.1 FR1
	Config 2, 5		SSB.1 FR1
	Config 3, 6		SSB.2 FR1
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1
	Config 3, 6		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5		15 KHz
	Config 3, 6		30 KHz
PRACH Configuration	Config 1, 2, 4, 5		Table A.3.8.2.4-1
	Config 3, 6		Table A.3.8.2.4-1
SSB index assigned as RLM RS			0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6

DRX Configuration			Table A.3.3.3-1
Gap pattern ID			N.A.
Layer 3 filtering			*Enabled*
T310 timer		ms	2000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1, 4		[CSI-RS.1.3 FDD]
	Config 2, 5		[CSI-RS.1.3 TDD]
	Config 3, 6		[CSI-RS.2.3 TDD]
T1		s	4
T2		s	1.6
T3		s	1.36
T4		s	0.4
T5		s	1.4
D1		s	1
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts. Note 3: E-UTRAN is in non-DRX mode under test.			

4.5.1.4.4.2 Test Procedure

The test consists of two cells, a single E-UTRA cell (Pcell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 1] with a reporting periodicity as mentioned in the above table 4.5.1.4.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [6] clause 4.5.

2. Set the parameters according to T1 in Table 4.5.1.4.4-1 for subtest 1 and 2. Propagation conditions are set according to Annex TBD. T1 starts.

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

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

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

6. When T4 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.4.5-1. T5 starts.

7. If the SS detects uplink power equal to or higher than -39 dBm in the On-duration part of every DRX cycle in the subframe according the configured CQI reporting mode (PUCCH 1-0) during the period from time point A to time point F (1120 ms after the start of time duration T5) the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

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

4.5.1.4.4.3 Message Contents

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

Table 4.5.1.4.4.3-1: Common Exception messages for EN-DC FR1 Radio Link Monitoring In-Sync Test for FR1 PSCell configured with SSB-based RLM RS in DRX mode

TBD

4.5.1.4.5 Test Requirement

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

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

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

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

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

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

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	4				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0				
EPRE ratio of PBCH DMRS to SSS		dB	0				
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR	Config 1, 4	dB	1	-7	-15	-4.5	1
	Config 2, 5		1	-7	-15	-4.5	1
	Config 3, 6		1	-7	-15	-4.5	1
N_{oc}	Config 1, 4	dBm/15 KHz	-98				
	Config 2, 5		-98				
	Config 3, 6		-98				
Propagation condition			TDL-C 300ns 100Hz				
Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG. Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs. Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.4.5.1.4.1-1. Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in section A.3.6.							

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

Editor's note:

- Message contents are not complete.
- Connection diagram is TBD.
- TT analysis is missing.
- RAN4 dependency: There are brackets and TBDs in core requirements and test parameters.

4.5.1.5.1 Test purpose

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

4.5.1.5.2 Test applicability

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

4.5.1.5.3 Minimum conformance requirements

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

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

4.5.1.5.4 Test description

The test consists of two subtests with two cells configured, the E-UTRA PCell and NR PSCell; the difference between the two subtests is whether the measurement gap is configured on the PCell and PSCell or not. Each subtest consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 4.5.1.5.4-1 shows the three different time durations and the corresponding variation of the downlink SNR in the active cell to emulate out-of-sync states.

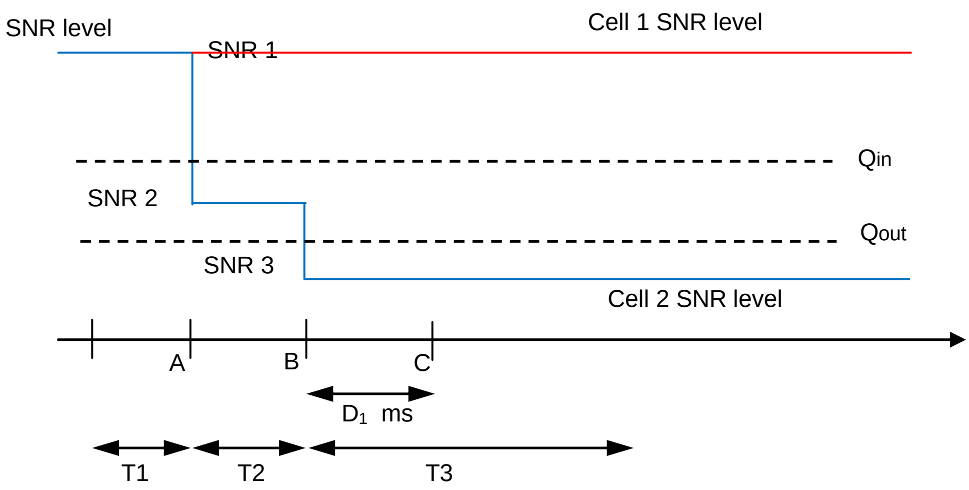


Figure 4.5.1.5.4-1: SNR variation for out-of-sync testing

4.5.1.5.4.1 Initial conditions

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

Table 4.5.1.5.4.1-1: Supported test configurations for FR1 PSCell

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

Test Environment: Normal, as defined in TS 38.508-1 [14] clause 4.1.

Frequencies to be tested: According to Annex E Table E.2-1 and TS 38.508-1 [14] clause 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: As specified by the test configuration selected from Table 4.5.1.5.4.1-1 and TS 38.508-1 [14] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources and faders to the UE antenna connectors as shown in TS 38.508-1 [14] FFS for UE part and FFS for TE part.

2. The general test parameter settings are set up according to Table 4.5.1.5.4.1-2. The measurement gap configuration for subtest 2 is according to Table 4.5.1.5.4.1-3. The NZP-CSI-RS configuration for subtest 1 and 2 is according to Table 4.5.1.5.4.1-4.

3. Propagation conditions are set according to Annex C.2.3.

4. Message contents are defined in clause 4.5.1.5.4.3.

5. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to Annex C.1.1 and C.1.2.

Table 4.5.1.5.4.1-2: General test parameters for FR1 PSCell for CSI-RS out-of-sync testing in non-DRX mode

Parameter		Unit	Value	
			Test 1	Test 2
Active E-UTRA PCell			Cell 1	Cell 1
E-UTRA RF Channel Number			1	1
Active PSCell			Cell 2	Cell 2
RF Channel Number			2	2
Duplex mode	Config 1, 4		FDD	FDD
	Config 2, 3, 5, 6		TDD	TDD
TDD Configuration	Config 1, 4		Not Applicable	Not Applicable
	Config 2, 5		[TDDConf.1.1]	[TDDConf.1.1]
	Config 3, 6		[TDDConf.1.2]	[TDDConf.1.2]
CORESET Reference Channel	Config 1, 4		[CR. 1.1 FDD]	[CR. 1.1 FDD]
	Config 2, 5		[CR. 1.1 TDD]	[CR. 1.1 TDD]
	Config 3, 6		[CR. 2.1 TDD]	[CR. 2.1 TDD]
SSB Configuration	Config 1, 4		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
	Config 2, 5		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
	Config 3, 6		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
SMTC Configuration	Config 1, 2, 4, 5		FR1 patterm 1	FR1 patterm 1
	Config 3, 6		FR1 patterm 2	FR1 patterm 2
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5		15 KHz	15 KHz
	Config 3, 6		30 KHz	30 KHz
csi-RS-Index assigned as RLM RS			[0]	[0]
OCNG parameters			TBD	TBD
CP length			Normal	Normal
Correlation Matrix and Antenna Configuration			[2x2 Low]	[2x2 Low]
Out of sync transmission parameters	DCI format		1-0	1-0
	Number of Control OFDM symbols		2	2
	Aggregation level	CCE	8	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4	4
	DMRS precoder granularity		REG bundle size	REG bundle size
	REG bundle size		6	6
DRX			*OFF*	*OFF*
Gap pattern ID			[N.A.]	*[*gp0*]
Layer 3 filtering			*Enabled*	*Enabled*
T310 timer		ms	*0*	*0*
T311 timer		ms	1000	1000
N310			1	1
N311			1	1
NZP CSI-RS configuration			[ResourceId 1]	[ResourceId 0]
ZP CSI-RS configuation			TBD	TBD
CSI-IM configuration			TBD	TBD
Periodic CSI reporting			PUCCH	PUCCH
CSI reporting periodicity	Config 1, 2, 4, 5	slot	[5]	[5]
	Config 3, 6		[10]	[10]
T1		s	1	1
T2		s	0.4	0.4

T3	s	[0.6]	[0.6]
D1	s	[0.24]	[0.44]
Note 1: UE-specific PDCCH is not transmitted after T1 starts. Note 2: E-UTRAN is in non-DRX mode under test.			

Table 4.5.1.5.4.1-3: Measurement gap configuration for FR1 CSI-RS out-of-sync radio link monitoring in non-DRX mode

Field	Test 2
	Value
gapOffset	[0]
Note 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM RS is partially overlapped with measurement gap)	

Table 4.5.1.5.4.1-4: NZP-CSI-RS resource configuration for FR1 CSI-RS out-of-sync radio link monitoring in non-DRX mode

Field	ResourceId 0	ResourceId 1
	Value	Value
frequencyDomainAllocation Note 1	row1	row2
startingRB	0	0
nrofRBs	Note 2	Note 2
Note 1: TS 38.211 [6] table 7.4.1.5.3-1 Note 2: nrofRBs is derived based on the Configuration in Table A.4.5.1.5.1-1		

4.5.1.5.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [5] or [10] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in subtest 2.

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

2. Set the parameters of Cell 2 according to T1 in Table 4.5.1.5.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.5.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.5.5-1. T3 starts.

5. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect any uplink power on NR carrier higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 4.5.1.5.5-1.

7. If the UE has not re-established the connection in at least [1s], the UE is switched off and then on. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

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

4.5.1.5.4.3 Message contents

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

Table 4.5.1.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

4.5.1.5.5 Test requirement

Tables 4.5.1.5.4.1-2 and 4.5.1.5.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with CSI-RS-based RLM in non-DRX mode.

Table 4.5.1.5.5-1: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in non-DRX mode

Parameter		Unit	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
PDCCH_beta		dB	4			4		
PDCCH_DMRS_beta		dB	4			4		
PBCH_beta		dB	0			0		
PSS_beta		dB						
SSS_beta		dB						
PDSCH_beta		dB						
OCNG_beta		dB						
SNR	Config 1, 4	dB	TBD	TBD	TBD	TBD	TBD	TBD
	Config 2, 5		TBD	TBD	TBD	TBD	TBD	TBD
	Config 3, 6		TBD	TBD	TBD	TBD	TBD	TBD
N_{oc}	Config 1, 4	dBm/15KHz	[-98] + TT			[-98] + TT		
	Config 2, 5		[-98] + TT			[-98] + TT		
	Config 3, 6		[-98] + TT			[-98] + TT		
Propagation condition			[TDL-C 300ns 100Hz]			[TDL-C 300ns 100Hz]		

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.1.5.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

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

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

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

The uplink signal is verified on the basis of the UE output power:
- UE output power equal to or higher than Transmit minimum power (as defined in TS 38.521-1 [17] clause 6.3.1.5) means uplink signal
- UE output power equal to or less than Transmit OFF power (as defined in TS 38.521-1 [17] clause 6.3.2.5) means no uplink signal.

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

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

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- TT analysis is missing.

- RAN4 dependency: There are brackets and TBDs in core requirements and test parameters.

4.5.1.6.1 Test purpose

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

4.5.1.6.2 Test applicability

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

4.5.1.6.3 Minimum conformance requirements

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

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.6.

4.5.1.6.4 Test description

The test consists of two subtests with two cells configured, the E-UTRA PCell and NR PSCell; the difference between the two subtests is whether the measurement gap is configured on the PCell and PSCell or not. Each subtest consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.1.6.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate in-sync states.

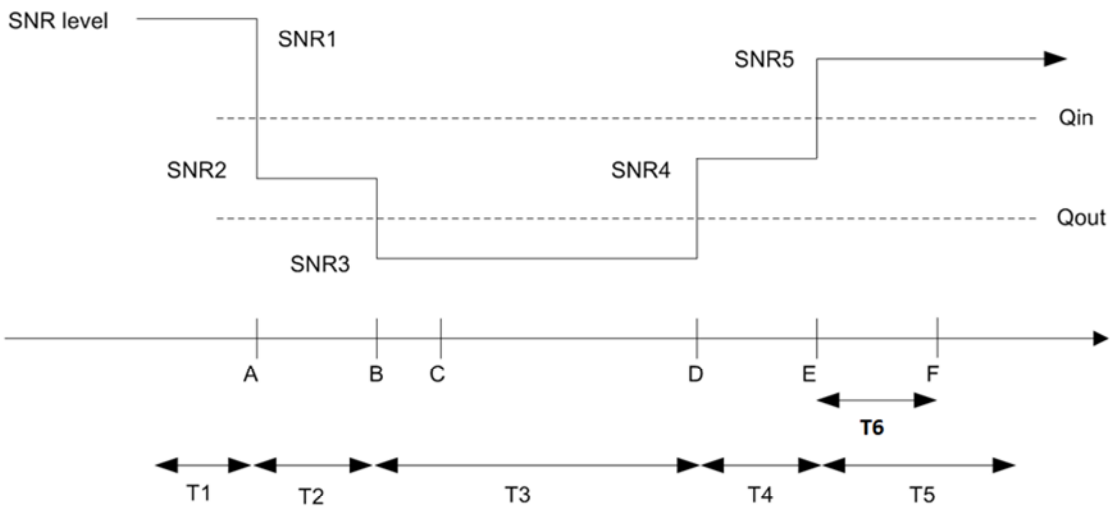


Figure 4.5.1.6.4-1: SNR variation for In-sync testing

4.5.1.6.4.1 Initial conditions

Test 4.5.1.6 can be run in one of the configurations defined in Table 4.5.1.6.4.1-1.

Table 4.5.1.6.4.1-1: Supported test configurations for FR1 PSCell

Configuration	Description
4.5.1.6-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.1.6-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.1.6-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.1.6-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.1.6-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.1.6-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Test Environment: Normal, as defined in TS 38.508-1 [14] clause 4.1.

Frequencies to be tested: According to Annex E Table E.2-1 and TS 38.508-1 [14] clause 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: As specified by the test configuration selected from Table 4.5.1.6.4.1-1 and TS 38.508-1 [14] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources and faders to the UE antenna connectors as shown in TS 38.508-1 [14] FFS for UE part and FFS for TE part.

2. The general test parameter settings are set up according to Table 4.5.1.6.4.1-2. The measurement gap configuration for subtest 2 is according to Table 4.5.1.6.4.1-3. The NZP-CSI-RS configuration for subtest 1 and 2 is according to Table 4.5.1.6.4.1-4.

3. Propagation conditions are set according to Annex C.2.3.

4. Message contents are defined in clause 4.5.1.6.4.3.

5. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to Annex C.1.1 and C.1.2.

Table 4.5.1.6.4.1-2: General test parameters for FR1 PSCell for CSI-RS In-sync testing in non-DRX mode

Parameter		Unit	Value	
			Test 1	Test 2
Active E-UTRA PCell			Cell 1	Cell 1
E-UTRA RF Channel Number			1	1
Active PSCell			Cell 2	Cell 2
RF Channel Number			2	2
Duplex mode	Config 1, 4		FDD	FDD
	Config 2, 3, 5, 6		TDD	TDD
TDD Configuration	Config 1, 4		Not Applicable	Not Applicable
	Config 2, 5		[TDDConf.1.1]	[TDDConf.1.1]
	Config 3, 6		[TDDConf.1.2]	[TDDConf.1.2]
CORESET Reference Channel	Config 1, 4		[CR. 1.1 FDD]	[CR. 1.1 FDD]
	Config 2, 5		[CR. 1.1 TDD]	[CR. 1.1 TDD]
	Config 3, 6		[CR. 2.1 TDD]	[CR. 2.1 TDD]
SSB Configuration	Config 1, 4		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
	Config 2, 5		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)

	Config 3, 6		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
SMTC Configuration	Config 1, 2, 4, 5		FR1 patterm 1	FR1 patterm 1
	Config 3, 6		FR1 patterm 2	FR1 patterm 2
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5		15 KHz	15 KHz
	Config 3, 6		30 KHz	30 KHz
csi-RS-Index assigned as RLM RS			[0]	[0]
OCNG parameters			TBD	TBD
CP length			Normal	Normal
Correlation Matrix and Antenna Configuration			[2x2 Low]	[2x2 Low]
Out of sync transmission parameters	DCI format		1-0	1-0
	Number of Control OFDM symbols		2	2
	Aggregation level	CCE	8	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4	4
	DMRS precoder granularity		REG bundle size	REG bundle size
	REG bundle size		6	6
In sync transmission parameters	DCI format		1-0	1-0
	Number of Control OFDM symbols		2	2
	Aggregation level	CCE	4	4
	Ratio of hypothetical PDCCH RE energy to average CSI-RS energy	dB	0	0

	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	0
	DMRS precoder granularity		REG bundle size	REG bundle size
	REG bundle size		6	6
DRX			*OFF*	*OFF*
Gap pattern ID			[N.A.]	*[*gp0*]*
Layer 3 filtering			*Enabled*	*Enabled*
T310 timer		ms	*0*	*0*
T311 timer		ms	1000	1000
N310			1	1
N311			1	1
NZP CSI-RS configuration			[ResourceId 1]	[ResourceId 0]
ZP CSI-RS configuation			TBD	TBD
CSI-IM configuration			TBD	TBD
Periodic CSI reporting			PUCCH	PUCCH
CSI reporting periodicity	Config 1, 2, 4, 5	slot	[5]	[5]
	Config 3, 6		[10]	[10]
T1		s	1	1
T2		s	0.4	0.4
T3		s	[0.6]	[0.6]
D1		s	[0.24]	[0.44]
Note 1: UE-specific PDCCH is not transmitted after T1 starts. Note 2: E-UTRAN is in non-DRX mode under test.				

Table 4.5.1.6.4.1-3: Measurement gap configuration for FR1 CSI-RS In-sync radio link monitoring in non-DRX mode

Field	Test 2
	Value
gapOffset	[0]
Note 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM RS is partially overlapped with measurement gap)	

Table 4.5.1.6.4.1-4: NZP-CSI-RS resource configuration for FR1 CSI-RS In-sync radio link monitoring in non-DRX mode

Field	ResourceId 0	ResourceId 1
	Value	Value

frequencyDomainAllocation Note 1	row1	row2
startingRB	0	0
nrofRBs	Note 2	Note 2
Note 1: TS 38.211 [6] table 7.4.1.5.3-1 Note 2: nrofRBs is derived based on the Configuration in Table A.4.5.1.6.1-1		

4.5.1.6.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [5] or [10] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in subtest 2.

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

2. Set the parameters of Cell 2 according to T1 in Table 4.5.1.6.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.6.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.6.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.1.6.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.1.6.5-1. T5 starts.

7. If the SS detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point F (T6 after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. After T5 expires, repeat steps 2-7 for both subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.1.6.4.3 Message contents

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

Table 4.5.1.6.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

4.5.1.6.5 Test requirement

Tables 4.5.1.6.4.1-2 and 4.5.1.6.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR1 PSCell configured with CSI-RS-based RLM in non-DRX mode.

Table 4.5.1.6.5-1: Cell specific test parameters for FR1 for CSI-RS In-sync radio link monitoring in non-DRX mode

Parameter	Unit	Test 1			Test 2		
		T1	T2	T3	T1	T2	T3

PDCCH_beta		dB	4			4		
PDCCH_DMRS_beta		dB	4			4		
PBCH_beta		dB	0			0		
PSS_beta		dB						
SSS_beta		dB						
PDSCH_beta		dB						
OCNG_beta		dB						
SNR	Config 1, 4	dB	TBD	TBD	TBD	TBD	TBD	TBD
	Config 2, 5		TBD	TBD	TBD	TBD	TBD	TBD
	Config 3, 6		TBD	TBD	TBD	TBD	TBD	TBD
N_{oc}	Config 1, 4	dBm/15K Hz	[-98] + TT			[-98] + TT		
	Config 2, 5		[-98] + TT			[-98] + TT		
	Config 3, 6		[-98] + TT			[-98] + TT		
Propagation condition			[TDL-C 300ns 100Hz]			[TDL-C 300ns 100Hz]		

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.1.6.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

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

During the period from time point A to time point F (T6 after the start of time duration T5) the UE shall transmit uplink signal at least in all slots configured for CQI transmission according to the configured CQI reporting mode on PUCCH.

The uplink signal is verified on the basis of the UE output power:

- UE output power equal to or higher than Transmit minimum power (as defined in TS 38.521-1 [17] clause 6.3.1.5) means uplink signal

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

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

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- TT analysis is missing.

- RAN4 dependency: There are brackets and TBDs in core requirements and test parameters.

4.5.1.7.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when DRX is used. This test will partly verify the FR1 PSCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 clause 8.1.

4.5.1.7.2 Test applicability

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

4.5.1.7.3 Minimum conformance requirements

The minimum requirements are specified in clause 4.5.1.0.3. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.7.

4.5.1.7.4 Test description

The test consists of two subtests with two cells configured, the E-UTRA PCell and NR PSCell; the difference between the two subtests is whether the measurement gap is configured on the PCell and PSCell or not. Each subtest consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 4.5.1.7.4-1 shows the three different time durations and the corresponding variation of the downlink SNR in the active cell to emulate out-of-sync states.

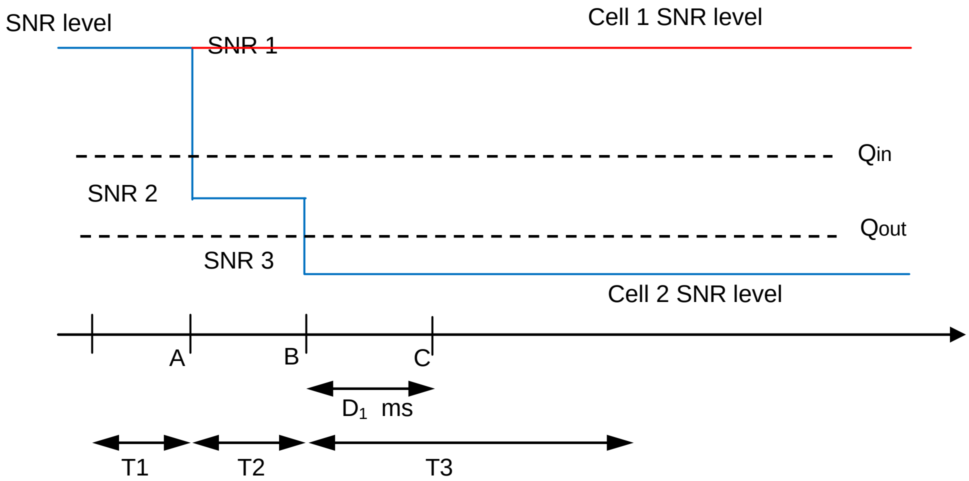


Figure 4.5.1.7.4-1: SNR variation for out-of-sync testing

4.5.1.7.4.1 Initial conditions

Test 4.5.1.7 can be run in one of the configurations defined in Table 4.5.1.7.4.1-1.

Table 4.5.1.7.4.1-1: Supported test configurations for FR1 PSCell

Configuration	Description
4.5.1.7-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.1.7-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.1.7-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.1.7-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.1.7-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.1.7-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Test Environment: Normal, as defined in TS 38.508-1 [14] clause 4.1.

Frequencies to be tested: According to Annex E Table E.2-1 and TS 38.508-1 [14] clause 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: As specified by the test configuration selected from Table 4.5.1.7.4.1-1 and TS 38.508-1 [14] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources and faders to the UE antenna connectors as shown in TS 38.508-1 [14] FFS for UE part and FFS for TE part.

2. The general test parameter settings are set up according to Table 4.5.1.7.4.1-2. The measurement gap configuration for subtest 2 is according to Table 4.5.1.7.4.1-3. The NZP-CSI-RS configuration for subtest 1 and 2 is according to Table 4.5.1.7.4.1-4. The DRX configuration for subtest 1 and 2 is according to Table 4.5.1.7.4.1-5. The time alignment timer configuration for subtest 1 and 2 is according to Table 4.5.1.7.4.1-6.

3. Propagation conditions are set according to Annex C.2.3.

4. Message contents are defined in clause 4.5.1.7.4.3.

5. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to Annex C.1.1 and C.1.2.

Table 4.5.1.7.4.1-2: General test parameters for FR1 PSCell for CSI-RS out-of-sync testing in DRX mode

Parameter		Unit	Value	
			Test 1	Test 2
Active E-UTRA PCell			Cell 1	Cell 1
E-UTRA RF Channel Number			1	1
Active PSCell			Cell 2	Cell 2
RF Channel Number			2	2
Duplex mode	Config 1, 4		FDD	FDD
	Config 2, 3, 5, 6		TDD	TDD
TDD Configuration	Config 1, 4		Not Applicable	Not Applicable
	Config 2, 5		[TDDConf.1.1]	[TDDConf.1.1]
	Config 3, 6		[TDDConf.1.2]	[TDDConf.1.2]
CORESET Reference Channel	Config 1, 4		[CR. 1.1 FDD]	[CR. 1.1 FDD]
	Config 2, 5		[CR. 1.1 TDD]	[CR. 1.1 TDD]
	Config 3, 6		[CR. 2.1 TDD]	[CR. 2.1 TDD]
SSB Configuration	Config 1, 4		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
	Config 2, 5		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
	Config 3, 6		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
SMTC Configuration	Config 1, 2, 4, 5		FR1 patterm 1	FR1 patterm 1
	Config 3, 6		FR1 patterm 2	FR1 patterm 2
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5		15 KHz	15 KHz
	Config 3, 6		30 KHz	30 KHz
csi-RS-Index assigned as RLM RS			[0]	[0]
OCNG parameters			TBD	TBD
CP length			Normal	Normal
Correlation Matrix and Antenna Configuration			[2x2 Low]	[2x2 Low]
Out of sync transmission parameters	DCI format		1-0	1-0
	Number of Control OFDM symbols		2	2
	Aggregation level	CCE	8	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4	4
	DMRS precoder granularity		REG bundle size	REG bundle size
	REG bundle size		6	6
DRX			*640*	*640*
Gap pattern ID			[N.A.]	*[*gp0*]*
Layer 3 filtering			*Enabled*	*Enabled*
T310 timer		ms	*0*	*0*
T311 timer		ms	1000	1000
N310			1	1
N311			1	1
NZP CSI-RS configuration			[ResourceId 1]	[ResourceId 0]
ZP CSI-RS configuation			TBD	TBD
CSI-IM configuration			TBD	TBD
Periodic CSI reporting			PUCCH	PUCCH
CSI reporting periodicity	Config 1, 2, 4, 5	slot	[5]	[5]
	Config 3, 6		[10]	[10]
T1		s	1	1
T2		s	0.4	0.4

T3	s	[0.6]	[0.6]
D1	s	[0.24]	[0.44]
Note 1: UE-specific PDCCH is not transmitted after T1 starts. Note 2: E-UTRAN is in non-DRX mode under test.			

Table 4.5.1.7.4.1-3: Measurement gap configuration for FR1 CSI-RS out-of-sync radio link monitoring in DRX mode

Field	Test 2
	Value
gapOffset	[0]
Note 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM RS is partially overlapped with measurement gap)	

Table 4.5.1.7.4.1-4: NZP-CSI-RS resource configuration for FR1 CSI-RS out-of-sync radio link monitoring in DRX mode

Field	ResourceId 0	ResourceId 1
	Value	Value
frequencyDomainAllocation[Note 1]	row1	row2
startingRB	0	0
nrofRBs	Note 2	Note 2
Note 1: TS 38.211 [6] table 7.4.1.5.3-1 Note 2: nrofRBs is derived based on the Configuration in Table A.4.5.1.7.1-1		

Table 4.5.1.7.4.1-5: DRX Configuration for FR1 CSI-RS out-of-sync radio link monitoring in DRX mode.

Field	Test 1	Test 2
	Value	Value
drx-onDurationTimer	[ms6]	[ms6]
drx-InactivityTimer	[ms1]	[ms1]
drx-RetransmissionTimerDL	[sl1]	[sl1]
drx-RetransmissionTimerUL	[sl1]	[sl1]
longDRX-CycleStartOffset	[ms640]	[ms40]
shortDRX	disable	disable

Table 4.5.1.7.4.1-6: TimeAlignmentTimer Configuration for FR1 CSI-RS out-of-sync radio link monitoring in DRX mode.

Field		Test 1	Test 2
		Value	Value
TimeAlignmentTimer		infinity	infinity
periodicityAndOffset in SchedulingRequestResourceConfig	Config 1, 2, 4, 5	[sl5]	[sl5]
	Config 3, 6	[sl10]	[sl10]

4.5.1.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [5] or [10] ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in subtest 2.

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

2. Set the parameters of Cell 2 according to T1 in Table 4.5.1.7.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.7.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.7.5-1. T3 starts.

5. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the On-duration part of every DRX cycle in the slots configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect any uplink power on NR carrier higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 4.5.1.7.5-1.

7. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

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

4.5.1.7.4.3 Message contents

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

Table 4.5.1.7.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

4.5.1.7.5 Test requirement

Tables 4.5.1.7.4.1-2 and 4.5.1.7.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with CSI-RS-based RLM in DRX mode.

Table 4.5.1.7.5-1: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in DRX mode

Parameter		Unit	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
PDCCH_beta		dB	4			4		
PDCCH_DMRS_beta		dB	4			4		
PBCH_beta		dB	0			0		
PSS_beta		dB						
SSS_beta		dB						
PDSCH_beta		dB						
OCNG_beta		dB						
SNR	Config 1, 4	dB	TBD	TBD	TBD	TBD	TBD	TBD
	Config 2, 5		TBD	TBD	TBD	TBD	TBD	TBD
	Config 3, 6		TBD	TBD	TBD	TBD	TBD	TBD
N_{oc}	Config 1, 4	dBm/ 15KHz	[-98] + TT			[-98] + TT		
	Config 2, 5		[-98] + TT			[-98] + TT		
	Config 3, 6		[-98] + TT			[-98] + TT		
Propagation condition			[TDL-C 300ns 100Hz]			[TDL-C 300ns 100Hz]		

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.1.7.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

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

During the period from time point A to time point B the UE shall transmit uplink signal at least once every DRX cycle, in the On-duration part of the cycle in the slots configured for CQI transmission according the configured CQI reporting mode on PUCCH.

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

The uplink signal is verified on the basis of the UE output power:
- UE output power equal to or higher than Transmit minimum power (as defined in TS 38.521-1 [17] clause 6.3.1.5) means uplink signal
- UE output power equal to or less than Transmit OFF power (as defined in TS 38.521-1 [17] clause 6.3.2.5) means no uplink signal.

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

4.5.1.8 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- TT analysis is missing.
- RAN4 dependency: There are brackets and TBDs in core requirements and test parameters.

4.5.1.8.1 Test purpose

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

4.5.1.8.2 Test applicability

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

4.5.1.8.3 Minimum conformance requirements

The minimum requirements are specified in clause 4.5.1.0.3. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.8.

4.5.1.8.4 Test description

The test consists of two subtests with two cells configured, the E-UTRA PCell and NR PSCell; the difference between the two subtests is whether the measurement gap is configured on the PCell and PSCell or not. Each subtest consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.1.8.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate in-sync states.

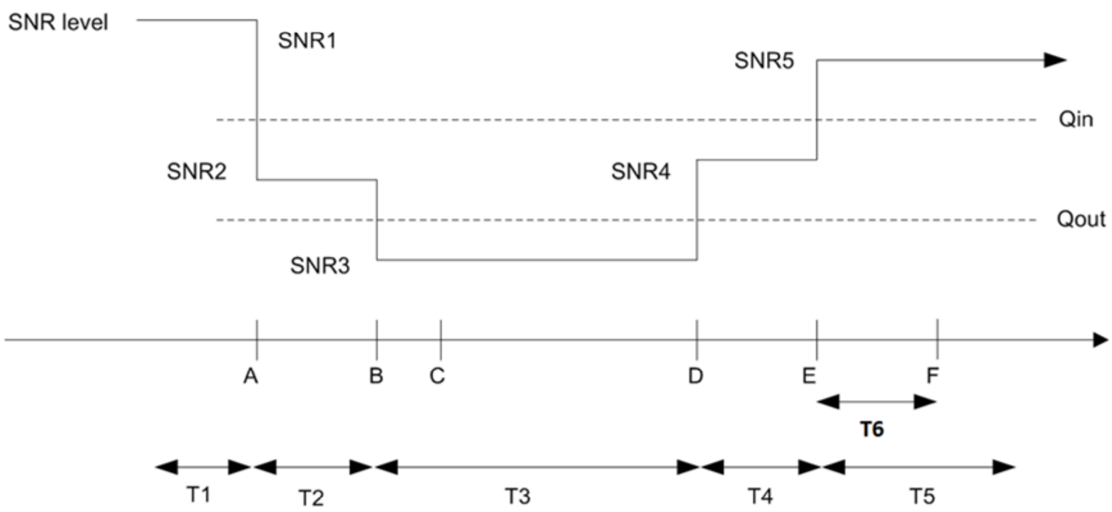


Figure 4.5.1.8.4-1: SNR variation for In-sync testing

4.5.1.8.4.1 Initial conditions

Test 4.5.1.8 can be run in one of the configurations defined in Table 4.5.1.8.4.1-1.

Table 4.5.1.8.4.1-1: Supported test configurations for FR1 PSCell

Configuration	Description
4.5.1.8-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.1.8-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.1.8-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.1.8-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.1.8-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.1.8-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Test Environment: Normal, as defined in TS 38.508-1 [14] clause 4.1.

Frequencies to be tested: According to Annex E Table E.2-1 and TS 38.508-1 [14] clause 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: As specified by the test configuration selected from Table 4.5.1.8.4.1-1 and TS 38.508-1 [14] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources and faders to the UE antenna connectors as shown in TS 38.508-1 [14] FFS for UE part and FFS for TE part.

2. The general test parameter settings are set up according to Table 4.5.1.8.4.1-2. The measurement gap configuration for subtest 2 is according to Table 4.5.1.8.4.1-3. The NZP-CSI-RS configuration for subtest 1 and 2 is according to Table 4.5.1.8.4.1-4. The DRX configuration for subtest 1 and 2 is according to Table 4.5.1.8.4.1-5. The time alignment timer configuration for subtest 1 and 2 is according to Table 4.5.1.8.4.1-6.

3. Propagation conditions are set according to Annex C.2.3.

4. Message contents are defined in clause 4.5.1.8.4.3.

5. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to Annex C.1.1 and C.1.2.

Table 4.5.1.8.4.1-2: General test parameters for FR1 PSCell for CSI-RS In-sync testing in DRX mode

Parameter		Unit	Value	
			Test 1	**Test 2**
Active E-UTRA PCell			Cell 1	Cell 1
E-UTRA RF Channel Number			1	1
Active PSCell			Cell 2	Cell 2
RF Channel Number			2	2
Duplex mode	Config 1, 4		FDD	FDD
	Config 2, 3, 5, 6		TDD	TDD
TDD Configuration	Config 1, 4		Not Applicable	Not Applicable
	Config 2, 5		[TDDConf.1.1]	[TDDConf.1.1]
	Config 3, 6		[TDDConf.1.2]	[TDDConf.1.2]
CORESET Reference Channel	Config 1, 4		[CR. 1.1 FDD]	[CR. 1.1 FDD]
	Config 2, 5		[CR. 1.1 TDD]	[CR. 1.1 TDD]
	Config 3, 6		[CR. 2.1 TDD]	[CR. 2.1 TDD]
SSB Configuration	Config 1, 4		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
	Config 2, 5		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
	Config 3, 6		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
SMTC Configuration	Config 1, 2, 4, 5		FR1 patterm 1	FR1 patterm 1
	Config 3, 6		FR1 patterm 2	FR1 patterm 2
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5		15 KHz	15 KHz
	Config 3, 6		30 KHz	30 KHz
csi-RS-Index assigned as RLM RS			[0]	[0]
OCNG parameters			TBD	TBD
CP length			Normal	Normal
Correlation Matrix and Antenna Configuration			[2x2 Low]	[2x2 Low]
Out of sync transmission parameters	DCI format		1-0	1-0
	Number of Control OFDM symbols		2	2
	Aggregation level	CCE	8	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4	4
	DMRS precoder granularity		REG bundle size	REG bundle size
	REG bundle size		6	6
In sync transmission parameters	DCI format		1-0	1-0
	Number of Control OFDM symbols		2	2
	Aggregation level	CCE	4	4
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	0
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	0
	DMRS precoder granularity		REG bundle size	REG bundle size

	REG bundle size		6	6
DRX			640	640
Gap pattern ID			[N.A.]	*[*gp0*]
Layer 3 filtering			*Enabled*	*Enabled*
T310 timer		ms	*0*	*0*
T311 timer		ms	1000	1000
N310			1	1
N311			1	1
NZP CSI-RS configuration			[ResourceId 1]	[ResourceId 0]
ZP CSI-RS configuation			TBD	TBD
CSI-IM configuration			TBD	TBD
Periodic CSI reporting			PUCCH	PUCCH
CSI reporting periodicity	Config 1, 2, 4, 5	slot	[5]	[5]
	Config 3, 6		[10]	[10]
T1		s	1	1
T2		s	0.4	0.4
T3		s	[0.6]	[0.6]
D1		s	[0.24]	[0.44]
Note 1: UE-specific PDCCH is not transmitted after T1 starts. Note 2: E-UTRAN is in non-DRX mode under test.				

Table 4.5.1.8.4.1-3: Measurement gap configuration for FR1 CSI-RS In-sync radio link monitoring in DRX mode

Field	Test 2
	Value
gapOffset	[0]
Note 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM RS is partially overlapped with measurement gap)	

Table 4.5.1.8.4.1-4: NZP-CSI-RS resource configuration for FR1 CSI-RS In-sync radio link monitoring in DRX mode

Field	ResourceId 0	ResourceId 1
	Value	Value
frequencyDomainAllocation Note 1	row1	row2
startingRB	0	0
nrofRBs	Note 2	Note 2
Note 1: TS 38.211 [6] table 7.4.1.5.3-1 Note 2: nrofRBs is derived based on the Configuration in Table A.4.5.1.8.1-1		

Table 4.5.1.8.4.1-5: DRX Configuration for FR1 CSI-RS in-sync radio link monitoring in DRX mode.

Field	Test 1	Test 2
	Value	Value
drx-onDurationTimer	[ms6]	[ms6]
drx-InactivityTimer	[ms1]	[ms1]
drx-RetransmissionTimerDL	[sl1]	[sl1]
drx-RetransmissionTimerUL	[sl1]	[sl1]
longDRX-CycleStartOffset	[ms640]	[ms40]
shortDRX	disable	disable

Table 4.5.1.8.4.1-6: TimeAlignmentTimer Configuration for FR1 CSI-RS in-sync radio link monitoring in DRX mode.

Field		Test 1	Test 2
		Value	Value
TimeAlignmentTimer		infinity	infinity
periodicityAndOffset in SchedulingRequestResourceConfig	Config 1, 2, 4, 5	[sl5]	[sl5]
	Config 3, 6	[sl10]	[sl10]

4.5.1.8.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [5] or [10] ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in subtest 2.

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

2. Set the parameters of Cell 2 according to T1 in Table 4.5.1.8.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.8.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.8.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.1.8.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.1.8.5-1. T5 starts.

7. If the SS detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the On-duration part of every DRX cycle in the configured slots for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point F (T6 after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. After T5 expires, repeat steps 2-7 for both subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.1.8.4.3 Message contents

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

Table 4.5.1.8.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

4.5.1.8.5 Test requirement

Tables 4.5.1.8.4.1-2 and 4.5.1.8.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR1 PSCell configured with CSI-RS-based RLM in DRX mode.

Table 4.5.1.8.5-1: Cell specific test parameters for FR1 for CSI-RS In-sync radio link monitoring in DRX mode

Parameter		Unit	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
PDCCH_beta		dB	4			4		
PDCCH_DMRS_beta		dB	4			4		
PBCH_beta		dB	0			0		
PSS_beta		dB						
SSS_beta		dB						
PDSCH_beta		dB						
OCNG_beta		dB						
SNR	Config 1, 4	dB	TBD	TBD	TBD	TBD	TBD	TBD
	Config 2, 5		TBD	TBD	TBD	TBD	TBD	TBD
	Config 3, 6		TBD	TBD	TBD	TBD	TBD	TBD
N_{oc}	Config 1, 4	dBm/15K Hz	[-98] + TT			[-98] + TT		
	Config 2, 5		[-98] + TT			[-98] + TT		
	Config 3, 6		[-98] + TT			[-98] + TT		
Propagation condition			[TDL-C 300ns 100Hz]			[TDL-C 300ns 100Hz]		

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.1.8.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

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

During the period from time point A to time point F (T6 after the start of time duration T5) the UE shall transmit uplink signal at least once every DRX cycle, in the ON-duration part of the cycle in the slots configured for CQI transmission according to the configured CQI reporting mode on PUCCH.

The uplink signal is verified on the basis of the UE output power:
- UE output power equal to or higher than Transmit minimum power (as defined in TS 38.521-1 [17] clause 6.3.1.5) means uplink signal

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

4.5.2 Interruption

4.5.2.0 Minimum conformance requirements

4.5.2.0.1 Minimum conformance requirements for interruptions at transitions between active and non-active during DRX.

[TS 38.133, clause 8.2.1.2.1]

Interruption on PSCell and the activated SCell if configured due to E-UTRA PCell transitions between active and non-active druing DRX when PSCell or SCell is in non-DRX are allowed with up to 1% probability of missed ACK/NACK when the configured E-UTRA PCell DRX cycle is less than 640 ms, and 0.625% probability of missed ACK/NACK is allowed when the configured E-UTRA PCell DRX cycle is 640 ms or longer. Each interruption shall not exceed X slot as defined in table 8.2.1.2.1-1.

Each interruption shall not exceed X slot as defined in table 8.2.1.2.1-1.

Table 8.2.1.2.1-1: Interruption length X at transition between active and non-active during DRX

μ	NR Slot length (ms)	Interruption length X	
		Sync	Async
0	1	1	2
1	0.5	1	2
2	0.25	3	
3	0.125	5	

When both E-UTRA PCell and PSCell are in DRX, no interruption is allowed.

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.1.

4.5.2.0.2 Minimum conformance requirements for interruptions during measurements on deactivated NR SCC

[TS 38.133, clause 8.2.1.2.5.1]

Interruption on PSCell and other active NR SCell(s) during measurement on the deactivated NR SCC shall meet requirements in clause 8.2.2.2.3, where the term PCell in clause 8.2.2.2.3 shall be deemed to be replaced with PSCell.

[TS 38.133, clause 8.2.2.2.3]

Interruptions on PCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 8.2.2.2.2-1 if the PCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 8.2.2.2.2-2 if the PCell is in the same band as the deactivated SCell.

Interruptions on active SCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 8.2.2.2.2-1 if the active SCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 8.2.2.2.2-2 if the active SCell is in the same band as the deactivated SCell.

[TS 38.133, clause 8.2.2.2.2]

Table 8.2.2.2.2-1: Interruption duration for SCell activation/deactivation for inter-band CA

μ	NR Slot length (ms)	Interruption length
0	1	1
1	0.5	1
2	0.25	2
3	0.125	4

Table 8.2.2.2.2-2: Interruption duration for SCell activation/deactivation for intra-band CA

μ	NR Slot length (ms)	Interruption length
0	1	1 + $T_{SMTC\_duration}$
1	0.5	1 + $T_{SMTC\_duration}$
2	0.25	2 + $T_{SMTC\_duration}$
3	0.125	4 + $T_{SMTC\_duration}$
Note: $T_{SMTC\_duration}$ is - the longest SMTC duration among all above activated serving cells and the SCell being activated when one SCell is activated; - the longest SMTC duration among all activated serving cells in the same band when one SCell is deactivated.		

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.5.1.

4.5.2.0.3 Minimum conformance requirements for interruptions during measurements on deactivated E-UTRAN SCC

[TS 38.133 clause 8.2.1.2.5.2]

When one E-UTRA SCell in MCG is deactivated, the UE is allowed due to measurements on the E-UTRA SCC with the deactivated E-UTRA SCell:

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK when any of the configured *measCycleSCell* [2] for the deactivated E-UTRA SCells is 640 ms or longer.
- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK regardless of the configured *measCycleSCell* [2] for the deactivated E-UTRA SCells if indicated by the network using IE *allowInterruptions* [2].

Each interruption shall not exceed

- X3 slot, if the PSCell or activated SCell is not in the same band as the E-UTRA deactivated SCC being measured, or
- Y3 slot + SMTC duration, if the PSCell or activated SCell is in the same band as the E-UTRA deactivated SCC being measured, provided the cell specific reference signals from the PSCell or activated SCell and the E-UTRA deactivated SCC being measured are available in the same slot.

Table 8.2.1.2.5-1: Interruption length X3 and Y3 at measurements on deactivated E-UTRA SCC

μ	NR Slot length (ms)	Interruption length X3 slot	Interruption length Y3 slot
0	1	1	1
1	0.5	1	1
2	0.25	2	2
3	0.125	4	4

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.5.1.

4.5.2.1 EN-DC FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- TT analysis is missing.

- RAN4 dependency: There are brackets and TBDs in core requirements and test parameters.

4.5.2.1.1 Test purpose

To verify E-UTRAN – NR Dual Connectivity UE's ability to complete PSCell interruption during LTE PCell DRX transitions within the missed ACK/NACK rate for NR PSCell in EN-DC requirements.

4.5.2.1.2 Test applicability

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

4.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.1.

4.5.2.1.4 Test description

4.5.2.1.4.1 Initial conditions

Test 4.5.2.1 can be run in one of the configurations defined in Table 4.5.2.1.4.1-1.

Table 4.5.2.1.4.1-1: Supported test configurations

Configuration	Description
4.5.2.1-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.1-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.1-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.2.1-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.1-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.1-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Test Environment: Normal, as defined in TS 38.508-1 [14] clause 4.1.

Frequencies to be tested: According to Annex E Table E.2-1 and TS 38.508-1 [14] clause 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: As specified by the test configuration selected from Table 4.5.2.1.4.1-1 and TS 38.508-1 [14] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in TS 38.508-1 [14] Annex A Figure TBD for UE part and Annex A Figure TBD for TE part.

2. The general test parameter settings are set up according to Table 4.5.2.1.4.1-2.

3. Propagation conditions are set according to Annex C.2.1.

4. Message contents are defined in clause 4.5.2.1.4.3.

5. There are one E-UTRAN carrier and one NR carrier and two cells in the test. Cell 1 is PCell on the E-UTRAN carrier, Cell 2 is PSCell on the NR carrier, Cell 1 is the cell used for connection setup with the power levels set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to Annex C.1.1 and C.1.2.

Table 4.5.2.1.4.1-2: General test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1 and cell 2
DRX		ON	DRX related parameters are defined in 4.5.2.1.5-2
Measurement gap pattern Id		OFF	
T1	s	10	

4.5.2.1.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1 and Cell2. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell.

1. Ensure the UE is in state FFS according to TS 38.508-1 [14] clause FFS.

2. Configure MCG according to TS 36.521-3 [26] Annex C.0, C.1 and SCG according to Annex C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall transmit an RRCConnectionReconfiguration message to configure PCell (Cell1) and PSCell (Cell2) on the MCG and SCG as per TS 36.508 [7] clause FFS with the message content exceptions defined in clause 4.5.2.1.4.3.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. The SS would ensure continuous transmission on PSCell, while not scheduling on PCell at least for 200 ms to ensure inactivity timer is expired on the UE for LTE PCell.

5. Set the parameters according to T1 in Table 4.5.2.1.5-1. Propagation conditions are set according to Annex C.2.1. T1 starts.

6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.

7. If more than 99% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.

8. If no two consecutive DTX is observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”.

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS. (if the paging fails, switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS),

   or

   - switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS.

10. Repeat step 3-9 until a test verdict has been achieved

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.
If all events pass, the test passes. If one event fails, the test fails.

4.5.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 4.6.1.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

4.5.2.1.5 Test requirement

Table 4.5.2.1.5.1-1 and 4.5.2.1.5-2 define the primary level settings including test tolerances for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC test.

Table 4.5.2.1.5-1: Cell specific test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range			FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.2.1
$BW_{channel}$	Config 1,4		10: $N_{RB,c}$ = 52
	Config 2,5		10: $N_{RB,c}$ = 52
	Config 3,6		40: $N_{RB,c}$ = 106
Initial BWP Configuration	Config 1,4		DLBWP.0.2 Note5
	Config 2,5		DLBWP.0.2 Note5
	Config 3,6		DLBWP.0.2 Note5
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2,5		SR.1.1 TDD
	Config 3,6		SR2.1 TDD
RMSI CORESET parameters	Config 1,4		CR.1.1 FDD
	Config 2,5		CR.1.1 TDD
	Config 3,6		CR2.1 TDD
PDCCH CORESET parameters	Config 1,4		CCR.1.1 FDD
	Config 2,5		CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD
OCNG Patterns			OP.1
SMTC Configuration			SMTC.1
SSB Configuration	Config 1,2,4,5		SSB.1 FR1
	Config 3,6		SSB.2 FR1
Correlation Matrix and Antenna Configuration			1x2 Low
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
N_{oc} Note 2		dBm/15 kHz	[-104]+TT
SS-RSRP Note 3		dBm/15 kHz	[-87] +TT
$\hat{E}_s/I_{ot}$		dB	17+TT
$\hat{E}_s/N_{oc}$		dB	17+TT
N_{oc} Note 2	Config 1,2,4,5	dBm/SCS	[-104] +TT
	Config 3,6		[-101] +TT
Io Note3	Config 1,2,4,5	dBm/ 9.36MHz	[-59] +TT
	Config 3,6	dBm/ 38.16MHz	[-61.9] +TT
Time offset to cell1 Note 4		µs	33
Propagation Condition			AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3 SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells
Note 5: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in TS 38.213 [3] section 12.

Table 4.5.2.1.5-2: E-UTRAN PCell DRX-Configuration for E-UTRAN - NR FR1 interruption at transitions between active and non-active during DRX in synchronous DC

Field	Cell1 Value	Comment
onDurationTimer	psf1	As specified in clause 6.3.2 in TS 36.331
drx-InactivityTimer[Note 1]	psf1	
drx-RetransmissionTimer	psf1	
longDRX-CycleStartOffset	Sf160	
shortDRX	disable	
Note 1: UE is continuously scheduled in NR PSCell		

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed X as defined in Table 4.5.2.1.5-3.

Table 4.5.2.1.5-3: Interruption length X at transition between active and non-active during DRX

μ	NR Slot length (ms)	Interruption length X
		Sync
0	1	1
1	0.5	1

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

4.5.2.2 EN-DC FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- TT analysis is missing.

- RAN4 dependency: There are brackets and TBDs in core requirements and test parameters.

4.5.2.2.1 Test purpose

To verify E-UTRAN – NR Dual Connectivity UE's ability to complete PSCell interruption during LTE PCell DRX transitions within the missed ACK/NACK rate for NR PSCell in asynchronous EN-DC requirements.

4.5.2.2.2 Test applicability

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

4.5.2.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.2.

4.5.2.2.4 Test description

4.5.2.2.4.1 Initial conditions

Test 4.5.2.2 can be run in one of the configurations defined in Table 4.5.2.2.4.1-1.

Table 4.5.2.2.4.1-1: Supported test configurations

Configuration	Description
4.5.2.2-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.2-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.2-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.2.2-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.2-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.2-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Test Environment: Normal, as defined in TS 38.508-1 [14] clause 4.1.

Frequencies to be tested: According to Annex E Table E.2-1 and TS 38.508-1 [14] clause 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: As specified by the test configuration selected from Table 4.5.2.2.4.1-1 and TS 38.508-1 [14] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in TS 38.508-1 [14] Annex A Figure TBD for UE part and Annex A Figure TBD for TE part.
2. The general test parameter settings are set up according to Table 4.5.2.2.4.1-2.
3. Propagation conditions are set according to Annex C.2.1.
4. Message contents are defined in clause 4.5.2.2.4.3.
5. There are one E-UTRAN carrier and one NR carrier and two cells in the test. Cell 1 is PCell on the E-UTRAN carrier, Cell 2 is PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power levels set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to Annex C.1.1 and C.1.2.

Table 4.5.2.2.4.1-2: General test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1 and cell 2
DRX		ON	DRX related parameters are defined in 4.5.2.2.5-2
Measurement gap pattern Id		OFF	
T1	s	10	

4.5.2.2.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1 and Cell2. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell.

1. Ensure the UE is in state FFS according to TS 38.508-1 [14] clause FFS.
2. Configure MCG according to TS 36.521-3 [26] Annex C.0, C.1 and SCG according to Annex C.1.1 and C.1.2 for all downlink physical channels.
3. The SS shall transmit an RRCConnectionReconfiguration message to configure PCell (Cell1) and PSCell (Cell2) on the MCG and SCG as per TS 36.508 [7] clause FFS with the message content exceptions defined in clause 4.5.2.2.4.3.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. The SS would ensure continuous transmission on PSCell, while not scheduling on PCell at least for 200 ms to ensure inactivity timer is expired on the UE for LTE PCell.

5. Set the parameters according to T1 in Table 4.5.2.2.5-1. Propagation conditions are set according to Annex C.2.1. T1 starts.

6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.

7. If more than 99% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.

8. If no two consecutive DTX is observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”.

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS. (if the paging fails, switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS),

   or

   - switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS.

10. Repeat step 3-9 until a test verdict has been achieved

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.
If all events pass, the test passes. If one event fails, the test fails.

4.5.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 4.6.1.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

4.5.2.2.5 Test requirement

Table 4.5.2.2.5.1-1 and 4.5.2.2.5-2 define the primary level settings including test tolerances for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC test.

Table 4.5.2.2.5-1: Cell specific test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

<table>
<tr><th colspan="2">Parameter</th><th>Unit</th><th>Cell 2</th></tr>
<tr><td colspan="2">Frequency Range</td><td></td><td>FR1</td></tr>
<tr><td rowspan="2">Duplex mode</td><td>Config 1,4</td><td rowspan="2"></td><td>FDD</td></tr>
<tr><td>Config 2,3,5,6</td><td>TDD</td></tr>
<tr><td rowspan="3">TDD configuration</td><td>Config 1,4</td><td rowspan="3"></td><td>Not Applicable</td></tr>
<tr><td>Config 2,5</td><td>TDDConf.1.1</td></tr>
<tr><td>Config 3,6</td><td>TDDConf.2.1</td></tr>
<tr><td rowspan="3">$BW_{channel}$</td><td>Config 1,4</td><td rowspan="3"></td><td>10: $N_{RB,c}$ = 52</td></tr>
<tr><td>Config 2,5</td><td>10: $N_{RB,c}$ = 52</td></tr>
<tr><td>Config 3,6</td><td>40: $N_{RB,c}$ = 106</td></tr>
<tr><td rowspan="3">Initial BWP Configuration</td><td>Config 1,4</td><td rowspan="3"></td><td>DLBWP.0.2 Note5</td></tr>
<tr><td>Config 2,5</td><td>DLBWP.0.2 Note5</td></tr>
<tr><td>Config 3,6</td><td>DLBWP.0.2 Note5</td></tr>
<tr><td rowspan="3">PDSCH Reference measurement channel</td><td>Config 1,4</td><td rowspan="3"></td><td>SR.1.1 FDD</td></tr>
<tr><td>Config 2,5</td><td>SR.1.1 TDD</td></tr>
<tr><td>Config 3,6</td><td>SR2.1 TDD</td></tr>
<tr><td rowspan="3">RMSI CORESET parameters</td><td>Config 1,4</td><td rowspan="3"></td><td>CR.1.1 FDD</td></tr>
<tr><td>Config 2,5</td><td>CR.1.1 TDD</td></tr>
<tr><td>Config 3,6</td><td>CR2.1 TDD</td></tr>
<tr><td rowspan="3">PDCCH CORESET parameters</td><td>Config 1,4</td><td rowspan="3"></td><td>CCR.1.1 FDD</td></tr>
<tr><td>Config 2,5</td><td>CCR.1.1 TDD</td></tr>
<tr><td>Config 3,6</td><td>CCR.2.1 TDD</td></tr>
<tr><td colspan="2">OCNG Patterns</td><td></td><td>OP.1</td></tr>
<tr><td colspan="2">SMTC Configuration</td><td></td><td>SMTC.1</td></tr>
<tr><td rowspan="2">SSB Configuration</td><td>Config 1,2,4,5</td><td rowspan="2"></td><td>SSB.1 FR1</td></tr>
<tr><td>Config 3,6</td><td>SSB.2 FR1</td></tr>
<tr><td colspan="2">Correlation Matrix and Antenna Configuration</td><td></td><td>1x2 Low</td></tr>
<tr><td colspan="2">EPRE ratio of PSS to SSS</td><td rowspan="9">dB</td><td rowspan="9">0</td></tr>
<tr><td colspan="2">EPRE ratio of PBCH DMRS to SSS</td></tr>
<tr><td colspan="2">EPRE ratio of PBCH to PBCH DMRS</td></tr>
<tr><td colspan="2">EPRE ratio of PDCCH DMRS to SSS</td></tr>
<tr><td colspan="2">EPRE ratio of PDCCH to PDCCH DMRS</td></tr>
<tr><td colspan="2">EPRE ratio of PDSCH DMRS to SSS</td></tr>
<tr><td colspan="2">EPRE ratio of PDSCH to PDSCH</td></tr>
<tr><td colspan="2">EPRE ratio of OCNG DMRS to SSS(Note 1)</td></tr>
<tr><td colspan="2">EPRE ratio of OCNG to OCNG DMRS (Note 1)</td></tr>
<tr><td colspan="2">N_{oc} Note 2</td><td>dBm/15 kHz</td><td>[-104]+TT</td></tr>
<tr><td colspan="2">SS-RSRP Note 3</td><td>dBm/15 kHz</td><td>[-87] +TT</td></tr>
<tr><td colspan="2">$\hat{E}_s/I_{ot}$</td><td>dB</td><td>17+TT</td></tr>
<tr><td colspan="2">$\hat{E}_s/N_{oc}$</td><td>dB</td><td>17+TT</td></tr>
<tr><td rowspan="2">N_{oc} Note 2</td><td>Config 1,2,4,5</td><td rowspan="2">dBm/SCS</td><td>[-104] +TT</td></tr>
<tr><td>Config 3,6</td><td>[-101] +TT</td></tr>
<tr><td rowspan="2">Io Note3</td><td>Config 1,2,4,5</td><td>dBm/ 9.36MHz</td><td>[-59] +TT</td></tr>
<tr><td>Config 3,6</td><td>dBm/ 38.16MHz</td><td>[-61.9] +TT</td></tr>
<tr><td colspan="2">Time offset to cell1 Note 4</td><td>µs</td><td>500</td></tr>
<tr><td colspan="2">Propagation Condition</td><td></td><td>AWGN</td></tr>
<tr><td colspan="4">Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells
Note 5: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in TS 38.213 [3] section 12.</td></tr>
</table>

Table 4.5.2.2.5-2: E-UTRAN PCell DRX-Configuration for E-UTRAN - NR FR1 interruption at transitions between active and non-active during DRX in asynchronous DC

Field	Cell1 Value	Comment
onDurationTimer	psf1	As specified in clause 6.3.2 in TS 36.331
drx-InactivityTimer[Note 1]	psf1	
drx-RetransmissionTimer	psf1	
longDRX-CycleStartOffset	Sf160	
shortDRX	disable	
Note 1: UE is continuously scheduled in NR PSCell		

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed X as defined in Table 4.5.2.2.5-3.

Table 4.5.2.2.5-3: Interruption length X at transition between active and non-active during DRX

μ	NR Slot length (ms)	Interruption length X
		Async
0	1	2
1	0.5	2

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

4.5.2.3 EN-DC FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- TT analysis is missing.

- RAN4 dependency: There are brackets and TBDs in core requirements and test parameters.

4.5.2.3.1 Test purpose

To verify E-UTRAN – NR Dual Connectivity UE's ability to complete PSCell interruptions during the measurement on the deactivated NR SCC within the missed ACK/NACK rate for NR PSCell in EN-DC requirements..

4.5.2.3.2 Test applicability

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

4.5.2.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.3.

4.5.2.3.4 Test description

4.5.2.3.4.1 Initial conditions

Test 4.5.2.3 can be run in one of the configurations defined in Table 4.5.2.3.4.1-1.

Table 4.5.2.3.4.1-1: Supported test configurations

Configuration	Description
4.5.2.3-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.3-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.3-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.2.3-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.3-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.3-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Test Environment: Normal, as defined in TS 38.508 [14] clause 4.1.

Frequencies to be tested: According to Annex E Table E.1-1 and TS 38.508 [14] clause 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: As specified by the test configuration selected from Table 4.5.2.3.4.1-1 and TS 38.508-1 [14] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in TS 38.508 [14] Annex A, Figure TBD for UE part and Annex A, Figure TBD for TE part.
2. The general test parameter settings are set up according to Table 4.5.2.3.4.1-2.
3. Propagation conditions are set according to Annex [C.2.1]
4. Message contents are defined in clause 4.5.2.3.4.3.
5. There are one E-UTRAN carrier and two NR carriers and three cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on one NR carrier and Cell 3 is the SCell on the other NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to Annex C.1.1 and C.1.2.

Table 4.5.2.3.4.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Active PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated SCell		Cell3	Deactivated SCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	s	10	

4.5.2.3.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN PCell, Cell2 is NR PSCell and Cell3 is deactivated NR SCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1, Cell2 and Cell3. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as NR deactivated SCell. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received by the UE, defines the start of time period T1. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state FFS according to TS 38.508-1 [14] clause TBD.

2. Configure MCG according to TS 36.521-3 [26] Annex C.0, C.1 and SCG according to Annex C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall transmit an RRCConnectionReconfiguration message including measCycleSCell or allowInterruptions for the deactivated NR SCell.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. Set the parameters according to T1 in Table 5.5.2.3.5-1. Propagation conditions are set according to Annex C.2.1. T1 starts.

6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.

7. If more than 99.5% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.

8. If no two consecutive DTX is observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”.

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS. (if the paging fails, switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS),

   or

   - switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS.

10. Repeat step 3-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

4.5.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 4.5.2.3.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

4.5.2.3.5 Test requirement

Table 4.5.2.3.5-1 defines the primary level settings including test tolerances for E-UTRAN – NR FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC test configurations.

Table 4.5.2.3.5-1: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter		Unit	Cell 2	Cell 3
Frequency Range			FR1	FR1
Duplex mode	Config 1,4		FDD	FDD
	Config 2,3,5,6		TDD	TDD
TDD configuration	Config 1,4		Not Applicable	Not Applicable
	Config 2,5		TDDConf.1.1	TDDConf.1.1
	Config 3,6		TDDConf.2.1	TDDConf.2.1
$BW_{channel}$	Config 1,4		10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	Config 2,5		10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	Config 3,6		40: $N_{RB,c}$ = 106	40: $N_{RB,c}$ = 106
Initial BWP Configuration	Config 1,4		DLBWP.0.2 Note6	DLBWP.0.2 Note6
	Config 2,5		DLBWP.0.2 Note6	DLBWP.0.2 Note6
	Config 3,6		DLBWP.0.2 Note6	DLBWP.0.2 Note6
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD	-
	Config 2,5		SR.1.1 TDD	-
	Config 3,6		SR2.1 TDD	-
RMSI CORESET parameters	Config 1,4		CR.1.1 FDD	CR.1.1 FDD
	Config 2,5		CR.1.1 TDD	CR.1.1 TDD
	Config 3,6		CR2.1 TDD	CR2.1 TDD
PDCCH CORESET parameters	Config 1,4		CCR.1.1 FDD	CCR.1.1 FDD
	Config 2,5		CCR.1.1 TDD	CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD	CCR.2.1 TDD
OCNG Patterns			OP.1	OP.1
SMTC Configuration			SMTC.1	SMTC.1
SSB Configuration	Config 1,2,4,5		SSB.1 FR1	SSB.1 FR1
	Config 3,6		SSB.2 FR1	SSB.2 FR1
Correlation Matrix and Antenna Configuration			1x2 Low	1x2 Low
EPRE ratio of PSS to SSS		dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note 2		dBm/15 kHz	[-104]+TT	[-104] +TT
SS-RSRP Note 3		dBm/15 kHz	[-87] +TT	[-87] +TT
$\hat{E}_s/I_{ot}$		dB	17+TT	17+TT
$\hat{E}_s/N_{oc}$		dB	17+TT	17+TT
N_{oc} Note 2	Config 1,2,4,5	dBm/SCS	[-104] +TT	[-104] +TT
	Config 3,6		[-101] +TT	[-101] +TT
Io Note3	Config 1,2,4,5	dBm/ 9.36MHz	[-59] +TT	[-59] +TT
	Config 3,6	dBm/ 38.16MHz	[-61.9] +TT	[-61.9] +TT
Time offset to cell1 Note 4		µs	33	33
Time offset to cell2 Note 5		µs	-	3
Propagation Condition			AWGN	AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells
Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.
Note 6: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in TS 38.213 [3] section 12.

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 4.5.2.3.5-2 if the NR PSCell is not in the same band as the deactivated SCell or Table 4.5.2.3.5-3 if the NR PSCell is in the same band as the deactivated SCell.

Table 4.5.2.3.5-2: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1
1	0.5	1

Table 4.5.2.3.5-3: Interruption duration if the NR PSCell is in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1
1	0.5	1

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

4.5.2.4 EN-DC FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- TT analysis is missing.

- RAN4 dependency: There are brackets and TBDs in core requirements and test parameters.

4.5.2.4.1 Test purpose

To verify E-UTRAN – NR Dual Connectivity UE's ability to complete PSCell interruptions during the measurement on the deactivated NR SCC within the missed ACK/NACK rate for NR PSCell in EN-DC requirements..

4.5.2.4.2 Test applicability

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

4.5.2.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.4.

4.5.2.4.4 Test description

4.5.2.4.4.1 Initial conditions

Test 4.5.2.4 can be run in one of the configurations defined in Table 4.5.2.4.4.1-1.

Table 4.5.2.4.4.1-1: Supported test configurations

Configuration	Description
4.5.2.4-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.4-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.4-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.2.4-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.4-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.4-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Test Environment: Normal, as defined in TS 38.508 [14] clause 4.1.

Frequencies to be tested: According to Annex E Table E.1-1 and TS 38.508 [14] clause 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: As specified by the test configuration selected from Table 4.5.2.4.4.1-1 and TS 38.508-1 [14] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in TS 38.508 [14] Annex A, Figure TBD for UE part and Annex A, Figure TBD for TE part.

2. The general test parameter settings are set up according to Table 4.5.2.4.4.1-2.

3. Propagation conditions are set according to Annex [C.2.1]

4. Message contents are defined in clause 4.5.2.4.4.3.

5. There are one E-UTRAN carrier and two NR carriers and three cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on one NR carrier and Cell 3 is the SCell on the other NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to Annex C.1.1 and C.1.2.

Table 4.5.2.4.4.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Active PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated SCell		Cell3	Deactivated SCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	s	10	

4.5.2.4.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN PCell, Cell2 is NR PSCell and Cell3 is deactivated NR SCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1, Cell2 and Cell3. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as NR deactivated SCell. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received by the UE, defines the start of time period T1. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state FFS according to TS 38.508-1 [14] clause TBD.

2. Configure MCG according to TS 36.521-3 [26] Annex C.0, C.1 and SCG according to Annex C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall transmit an RRCConnectionReconfiguration message including measCycleSCell or allowInterruptions for the deactivated NR SCell.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. Set the parameters according to T1 in Table 5.5.2.3.5-1. Propagation conditions are set according to Annex C.2.1. T1 starts.

6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.

7. If more than 99.5% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.

8. If no two consecutive DTX is observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”.

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS. (if the paging fails, switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS),

   or

   - switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS.

10. Repeat step 3-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

4.5.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 4.5.2.4.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

4.5.2.4.5 Test requirement

Table 4.5.2.4.5-1 defines the primary level settings including test tolerances for E-UTRAN – NR FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC test configurations.

Table 4.5.2.4.5-1: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter		Unit	Cell 2	Cell 3
Frequency Range			FR1	FR1
Duplex mode	Config 1,4		FDD	FDD
	Config 2,3,5,6		TDD	TDD
TDD configuration	Config 1,4		Not Applicable	Not Applicable
	Config 2,5		TDDConf.1.1	TDDConf.1.1
	Config 3,6		TDDConf.2.1	TDDConf.2.1
$BW_{channel}$	Config 1,4		10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	Config 2,5		10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	Config 3,6		40: $N_{RB,c}$ = 106	40: $N_{RB,c}$ = 106
Initial BWP Configuration	Config 1,4		DLBWP.0.2 Note6	DLBWP.0.2 Note6
	Config 2,5		DLBWP.0.2 Note6	DLBWP.0.2 Note6
	Config 3,6		DLBWP.0.2 Note6	DLBWP.0.2 Note6
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD	-
	Config 2,5		SR.1.1 TDD	-
	Config 3,6		SR2.1 TDD	-
RMSI CORESET parameters	Config 1,4		CR.1.1 FDD	CR.1.1 FDD
	Config 2,5		CR.1.1 TDD	CR.1.1 TDD
	Config 3,6		CR2.1 TDD	CR2.1 TDD
PDCCH CORESET parameters	Config 1,4		CCR.1.1 FDD	CCR.1.1 FDD
	Config 2,5		CCR.1.1 TDD	CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD	CCR.2.1 TDD
OCNG Patterns			OP.1	OP.1
SMTC Configuration			SMTC.1	SMTC.1
SSB Configuration	Config 1,2,4,5		SSB.1 FR1	SSB.1 FR1
	Config 3,6		SSB.2 FR1	SSB.2 FR1
Correlation Matrix and Antenna Configuration			1x2 Low	1x2 Low
EPRE ratio of PSS to SSS		dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note 2		dBm/15 kHz	[-104]+TT	[-104] +TT
SS-RSRP Note 3		dBm/15 kHz	[-87] +TT	[-87] +TT
$\hat{E}_s/I_{ot}$		dB	17+TT	17+TT
$\hat{E}_s/N_{oc}$		dB	17+TT	17+TT
N_{oc} Note 2	Config 1,2,4,5	dBm/S	[-104] +TT	[-104] +TT
	Config 3,6		[-101] +TT	[-101] +TT
Io Note3	Config 1,2,4,5	dBm/ 9.36MHz	[-59] +TT	[-59] +TT
	Config 3,6	dBm/ 38.16MHz	[-61.9] +TT	[-61.9] +TT
Time offset to cell1 Note 4		µs	3	3
Time offset to cell2 Note 5		µs	-	3
Propagation Condition			AWGN	AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells
Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.
Note 6: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in TS 38.213 [3] section 12.

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 4.5.2.4.5-2 if the NR PSCell is not in the same band as the deactivated SCell or Table 4.5.2.4.5-3 if the NR PSCell is in the same band as the deactivated SCell.

Table 4.5.2.4.5-2: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1
1	0.5	1

Table 4.5.2.4.5-3: Interruption duration if the NR PSCell is in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1
1	0.5	1

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

4.5.2.5 EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

4.5.2.5.1 Test purpose

To verify E-UTRAN – NR Dual Connectivity UE's ability to complete PSCell interruptions during the measurement on E-UTRAN SCC within the missed ACK/NACK rate for NR PSCell in EN-DC requirements..

4.5.2.5.2 Test applicability

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

4.5.2.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.5.

4.5.2.5.4 Test description

4.5.2.5.4.1 Initial conditions

Test 4.5.2.5 can be run in one of the configurations defined in Table 4.5.2.5.4.1-1.

Table 4.5.2.5.4.1-1: Supported test configurations

Configuration	Description
4.5.2.5-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.5-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.5-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.2.5-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.5-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.5-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Test Environment: Normal, as defined in TS 38.508 [14] clause 4.1.

Frequencies to be tested: According to Annex E Table E.1-1 and TS 38.508 [14] clause 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: As specified by the test configuration selected from Table Table 4.5.2.5.4.1-1 and TS 38.508-1 [14] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in TS 38.508 [14] Annex A, Figure TBD for UE part and Annex A, Figure TBD for TE part.

2. The general test parameter settings are set up according to Table 4.5.2.5.4.1-2.

3. Propagation conditions are set according to Annex [C.2.1]

4. Message contents are defined in clause 4.5.2.5.4.3.

5. There are two E-UTRAN carriers and one NR carrier and three cells specified in the test. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to Annex C.1.1 and C.1.2.

Table 4.5.2.5.4.1-2: General test parameters for E-UTRAN – NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Active PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated SCell		Cell3	Deactivated SCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	s	10	

4.5.2.5.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1, Cell2 and Cell3. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as NR deactivated SCell. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the E-UTRAN NR SCells is received by the UE, defines the start of time period T1. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state FFS according to TS 38.508-1 [14] clause TBD.

2. Configure MCG according to TS 36.521-3 [26] Annex C.0, C.1 and SCG according to Annex C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall transmit an RRCConnectionReconfiguration message including measCycleSCell or allowInterruptions for the deactivated NR SCell to perform measurements on the deactivated SCC.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. Set the parameters according to T1 in Table 5.5.2.3.5-1. Propagation conditions are set according to Annex C.2.1. T1 starts.

6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.

7. If more than 99.5% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.

8. If no two consecutive DTX is observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”.

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS. (if the paging fails, switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS),

   or

   - switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS.

10. Repeat step 3-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

4.5.2.5.4.3 Message contents

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

Table 4.5.2.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

4.5.2.5.5 Test requirement

Table 4.5.2.5.5-1 defines the primary level settings including test tolerances for E-UTRAN – NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC test configurations.

Table 4.5.2.5.5-1: NR cell specific test parameters for E-UTRAN – NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range			FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.2.1
$BW_{channel}$	Config 1,4	MHz	10: $N_{RB,c}$ = 52
	Config 2,5		10: $N_{RB,c}$ = 52
	Config 3,6		40: $N_{RB,c}$ = 106
Initial BWP Configuration	Config 1,4		DLBWP.0.2^{Note5}
	Config 2,5		DLBWP.0.2^{Note5}
	Config 3,6		DLBWP.0.2^{Note5}
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2,5		SR.1.1 TDD
	Config 3,6		SR2.1 TDD
RMSI CORESET parameters	Config 1,4		CR.1.1 FDD
	Config 2,5		CR.1.1 TDD
	Config 3,6		CR2.1 TDD
RMC CORESET parameters	Config 1,4		CCR.1.1 FDD
	Config 2,5		CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD
OCNG Patterns			OP.1
SMTC Configuration			SMTC.1
SSB Configuration	Config 1,2,4,5		SSB.1 FR1
	Config 3,6		SSB.2 FR1
Correlation Matrix and Antenna Configuration			1x2 Low
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
$N_{oc}$$^{Note 2}$		dBm/15 kHz	[-104] +TT
SS-RSRP $^{Note 3}$		dBm/15 kHz	[-87] +TT
$\hat{E}_s/I_{ot}$		dB	17+TT
$\hat{E}_s/N_{oc}$		dB	17+TT
$N_{oc}$$^{Note 2}$	Config 1,2,4,5	dBm/SCS	[-104] +TT
	Config 3,6		[-101] +TT
Io^{Note3}	Config 1,2,4,5	dBm/ 9.36MHz	[-59] +TT
	Config 3,6	dBm/ 38.16MHz	[-61.9] +TT
Time offset to cell1 $^{Note 4}$		µs	33
Propagation Condition			AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells
Note 5: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in TS 38.213 [3] section 12.

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed X defined in Table 4.5.2.5.5-2 if the NR PSCell is not in the same band as the E-UTRAN deactivated SCell or Y in Table Table 4.5.2.5.5-2 if the NR PSCell is in the same band as the E-UTRAN deactivated SCell.

Table 4.5.2.5.5-2: Interruption length X and Y at measurements on deactivated E-UTRA SCC

μ	NR Slot length (ms)	Interruption length X slot Sync	Interruption length Y slot
0	1	1	1
1	0.5	1	1

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

4.5.2.6 EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Editor's note:

- Message contents are missing.

- Some parts of TC is TBD.

- Connection diagram is TBD.

- Test tolerance is missing.

- Cell mapping is missing

4.5.2.6.1 Test purpose

The purpose of this test is to verify EN-DC UE's ability to complete PSCell interruptions during the measurement on E-UTRAN SCC within the missed ACK/NACK rate for NR PSCell in EN-DC requirements.

4.5.2.6.2 Test applicability

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

4.5.2.6.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.6.

4.5.2.6.4 Test description

4.5.2.6.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 4.5.2.6.4.1-1.

Table 4.5.2.6.4.1-1: Supported test configurations for EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Configuration	Description
4.5.2.6-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.6-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.6-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.2.6-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.6-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.6-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.6.4.1-2.

Table 4.5.2.6.4.1-2: Initial conditions for EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.2.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 4.5.2.6.4.1-3.
2. Message contents are defined in clause 4.5.2.6.4.3.
3. There are two E-UTRAN carriers and one NR carrier and three cells specified in the test. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. Cell 1 is the cell used for connection setup with the power level set according to [TBD]. Cell 2 and Cell 3 shall be configured according to [TBD].

Table 4.5.2.6.4.1-3: General test parameters for EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Active PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated SCell		Cell3	Deactivated SCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	s	10	

4.5.2.6.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1, Cell2 and Cell3. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as NR deactivated SCell. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the E-UTRAN NR SCells is received by the UE, defines the start of time period T1. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state FFS according to TS 38.508-1 [14] clause TBD.
2. Configure MCG according to TS 36.521-3 [26] Annex C.0, C.1 and SCG according to Annex C.1.1 and C.1.2 for all downlink physical channels.
3. The SS shall transmit an RRCConnectionReconfiguration message including measCycleSCell or allowInterruptions for the deactivated NR SCell to perform measurements on the deactivated SCC.
4. The UE shall transmit RRCConnectionReconfigurationComplete message.
5. Set the parameters according to T1 in Table 5.5.2.3.5-1. Propagation conditions are set according to Annex C.2.1. T1 starts.
6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.
7. If more than 99.5% of uplink transmissions are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".
8. If no two consecutive DTX is observed by the SS, then count a success for the event "DTX". Otherwise count a fail for the event "DTX".
9. After the RRC connection release, the SS:
    - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS. (if the paging fails, switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS),

    or

    - switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS.
10. Repeat step 3-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

4.5.2.6.4.3 Message contents

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

Table 4.5.2.6.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

4.5.2.6.5 Test requirement

Table 4.5.2.6.5-1 defines the primary level settings including test tolerances for EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC test configurations.

Table 4.5.2.6.5-1: NR cell specific test parameters for EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range			FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.2.1
$BW_{channel}$	Config 1,4	MHz	10: $N_{RB,c}$ = 52
	Config 2,5		10: $N_{RB,c}$ = 52
	Config 3,6		40: $N_{RB,c}$ = 106
Initial BWP Configuration	Config 1,4		DLBWP.0.2 Note5
	Config 2,5		DLBWP.0.2 Note5
	Config 3,6		DLBWP.0.2 Note5
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2,5		SR.1.1 TDD
	Config 3,6		SR2.1 TDD
RMSI CORESET parameters	Config 1,4		CR.1.1 FDD
	Config 2,5		CR.1.1 TDD
	Config 3,6		CR2.1 TDD
RMC CORESET parameters	Config 1,4		CCR.1.1 FDD
	Config 2,5		CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD
OCNG Patterns			OP.1
SMTC Configuration			SMTC.1
SSB Configuration	Config 1,2,4,5		SSB.1 FR1
	Config 3,6		SSB.2 FR1
Correlation Matrix and Antenna Configuration			1x2 Low
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} Note 2		dBm/15 kHz	[-104]+TT
SS-RSRP Note 3		dBm/15 kHz	[-87] +TT
$\hat{E}_s/I_{ot}$		dB	17+TT
$\hat{E}_s/N_{oc}$		dB	17+TT
N_{oc} Note 2	Config 1,2,4,5	dBm/SCS	[-104] +TT
	Config 3,6		[-101] +TT
Io Note3	Config 1,2,4,5	dBm/ 9.36MHz	[-59] +TT
	Config 3,6	dBm/ 38.16MHz	[-61.9] +TT
Time offset to cell1 Note 4		µs	500
Propagation Condition			AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells
Note 5: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in TS 38.213 [3] section 12.

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on E-UTRAN PCell and NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on E-UTRAN PCell and NR PSCell shall not exceed the value defined in Table 4.5.2.6.5-2 and Table 4.5.2.6.5-3.

Table 4.5.2.6.5-2: Interruption duration if the NR PSCell is not in the same band as the E-UTRAN deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1
1	0.5	1

Table 4.5.2.6.5-3: Interruption duration if the NR PSCell is in the same band as the E-UTRAN deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1 + SMTC duration
1	0.5	2 + SMTC duration

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

4.5.3 SCell activation and deactivation delay

4.5.3.0 Minimum conformance requirements

4.5.3.0.1 Minimum conformance requirements for SCell activation and deactivation delay

UE configured with one downlink SCell in SCG in EN-DC, or in standalone NR carrier aggregation and when one SCell is being activated.

The delay within which the UE shall be able to activate the deactivated SCell depends upon the specified conditions.

Upon receiving SCell activation command in slot *n*, the UE shall be capable to transmit valid CSI report and apply actions related to the activation command for the SCell being activated no later than in slot *n*+ [T_{HARQ} + $T_{activation\_time}$ + $T_{CSI\_Reporting}$], where:

T_{HARQ} is the timing between DL data transmission and acknowledgement as specified in [7].

$T_{activation\_time}$ is the SCell activation delay. If the SCell is known and belongs to FR1, $T_{activation\_time}$ is:

- [T_{SMTC_SCell} + 5ms], if the SCell measurement cycle is equal to or smaller than [160ms].
- [T_{SMTC_MAX} + T_{SMTC_SCell} + 5ms], if the SCell measurement cycle is larger than [160ms].

If the SCell is unknown and belongs to FR1, $T_{activation\_time}$ is:

- [2*T_{SMTC_MAX} + 2*T_{SMTC_SCell} + 5ms] provided the SCell can be successfully detected on the first attempt.

If the SCell being activated belongs to FR2, $T_{activation\_time}$ is:

- [T_{SMTC_SCell} + 5ms] if there is at least one active serving cell on that FR2 band, provided that the SSBs in the serving cell(s) and the SSBs in the SCell fulfil the condition defined in section 3.6.3.
- [TBD* T_{SMTC_SCell} + 5ms] if there is no active serving cell on that FR2 band provided that PCell or PSCell is FR1.

Where,

T_{SMTC_MAX}:

- In FR1, in case of intra-band SCell activation, T_{SMTC_MAX} is the longer SMTC periodicity between active serving cells and SCell being activated provided the cell specific reference signals from the active serving cells and the SCells being activated or released are available in the same slot; in case of inter-band SCell activation, T_{SMTC_MAX} is the SMTC periodicity of SCell being activated.

- In FR2, T_{SMTC_MAX} is the longer SMTC periodicity between active serving cells and SCell being activated provided that in Rel-15 only support FR2 intra-band CA.

- T_{SMTC_MAX} is bounded to a minimum value of 10ms.

T_{SMTC_SCell}: SMTC periodicity of SCell being activated and the minimum value is 10ms.

$T_{CSI\_reporting}$ is the delay including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting and uncertainty in acquiring the first available CSI reporting resources as specified in [2].

SCell in FR1 is known if it has been meeting the following conditions:

- During the period equal to max([5] measCycleSCell, [5] DRX cycles) for FR1 before the reception of the SCell activation command:
  - the UE has sent a valid measurement report for the SCell being activated and
  - the SSB measured remains detectable according to the cell identification conditions specified in section 9.2 and 9.3.
- the SSB measured during the period equal to max([5] measCycleSCell, [5] DRX cycles) also remains detectable during the SCell activation delay according to the cell identification conditions specified in section 9.2 and 9.3.

Otherwise SCell in FR1 is unknown.

If the UE has been provided with higher layer in TS 38.331 [2] signaling of *smtc2* prior to the activation command, T_{SMTC_Scell} follows *smtc1* or *smtc2* according to the physical cell ID of the target cell being activated. T_{SMTC_MAX} follows *smtc1* or *smtc2* according to the physical cell IDs of the target cells being activated and the active serving cells.

In addition to CSI reporting defined above, UE shall also apply other actions related to the activation command specified in [2] for an SCell at the first opportunities for the corresponding actions once the SCell is activated.

The interruption on PSCell or any activated SCell in SCGfor EN-DC mode specified in section 8.2 shall not occur before slot n+1+[T_{HARQ}] and not occur after slot n+1+[_T_{HARQ} +3ms + T_{SMTC_MAX} + $T_{SMTC\_duration}$].

The interruption on PCell or any activated SCell in MCG for NR standalone mode specified in section 8.2 shall not occur before slot n+1+[T_{HARQ}] and not occur after slot n+1+[_T_{HARQ} +3ms + T_{SMTC_MAX} + $T_{SMTC\_duration}$].

Starting from the slot specified in section 4.3 of [3] (timing for secondary Cell activation/deactivation) and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

Upon receiving SCell deactivation command or upon expiry of the *sCellDeactivationTimer* in slot *n*, the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot *n*+[T_{HARQ} +3ms].

The interruption on PSCell or any activated SCell in SCG for EN-DC mode specified in section 8.2 shall not occur before slot n+1+[T_{HARQ}] and not occur after slot n+1+[T_{HARQ} +3ms].

The interruption on PCell or any activated SCell in MCG for NR standalone mode specified in section 8.2 shall not occur before slot n+1+[T_{HARQ}] and not occur after slot n+1+[_T_{HARQ} +3ms].

The normative reference for this requirement is TS 38.133 [6] clause 8.3.

4.5.3.1 EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 160ms SCell measurement cycle

Editor's notes: This clause is incomplete, the following items are TBD

- *The core requirements in TS 38.133 are between [.] or TBD;*

- *Test tolerance analysis is missing;*
- *Test procedure and Message content are TBD;*
- *Cell mapping and Connection diagram is TBD;*
- *Test applicability Table in TS38.522 need to be updated.*

4.5.3.1.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements, when the SCell in FR1 is known by the UE at the time of activation.

4.5.3.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.5.3.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.3.1.

4.5.3.1.4 Test description

4.5.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.3.1.4.1-1.

Table 4.5.3.1.4.1-1: supported test configurations

Test Case ID	Description
4.5.3.1-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.3.1-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.3.1-3	LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.3.1-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.3.1-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.3.1-6	LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 4.5.3.1.4.1-2 and Table 4.5.3.1.4.1-3.

Table 4.5.3.1.4.1-2: Initial conditions for known FR1 SCell activation case

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.1.2-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	

Exceptions to connection diagram	N/A	

Table 4.5.3.1.4.1-3: General test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle

Parameter	Unit	Value	Comment
RF Channel Number		1,2,3	One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test
Active PCell		Cell 1	Primary cell on E-UTRAN RF channel number 1. As specified in section A.3.7.2.1 of TS38.133 [6]
Active PSCell		Cell 2	Primary secondary cell on NR RF channel number 2.
Configured deactivated SCell		Cell 3	Configured deactivated secondary cell on NR RF channel number 3
CP length		Normal	
DRX		OFF	Continuous monitoring of primary cell
CQI/PMI periodicity and offset configuration index		0	CQI reporting for SCell every second subframe
Cell-individual offset for cells on E-UTRA RF channel number	dB	0	Individual offset for cells on primary component carrier.
Cell-individual offset for cells on NR channel number	dB	0	Individual offset for cells on secondary component carrier.
SCell measurement cycle (measCycleSCell)	ms	160	
Cell3 timing offset to cell2	µs	0	
Time alignment error between cell3 and cell2	µs	≤ Time alignment error as specified in 3GPP TS 38.104 [xx] clause 6.5.3.1. Editor's note: spec is not listed!	The value of time alignment error depends upon the type of carrier aggregation.
T1	s	[7]	During this time the PSCell shall be known and the SCell configured and detected.
T2	s	[1]	During this time the UE shall activate the SCell.
T3	s	[1]	During this time the UE shall deactivate the SCell.
T_{HARQ}	ms	TBD	the timing between DL data transmission and acknowledgement as specified in 38.321 [12]
$T_{CSI\_Reporting}$	ms	[2]	the delay uncertainty in acquiring the first available CSI reporting resources as specified in 38.331 [13]
k	ms	TBD	As specified in section 4.3 of TS38.213 [8]

1. Message contents are defined in clause 4.5.3.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the deactivated SCell.

4.5.3.1.4.2 Test procedure

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, E-UTRA has one cell, NR has two cells. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR.

The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

During T2 the Test procedure requires the UE to send the first CSI report for SCell1 in a subframe (m+[k]), but also allows a subframe not happen outside the slot (m+1+[T_{HARQ}]) to (m+1+[T_{HARQ}+3ms+T_{SSB_max}+$T_{SMTC\_duration}$]) if the subframe (m+[k]) was subject to interruption. The SS determines whether the CSI report in subframe (m+[k]) was interrupted or not by monitoring ACK/NACK sent in PSCell in subframe (m+[k]).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG according to TS 38.508-1 [14] clause 4.5.
2. TBD.

4.5.3.1.4.3 Message contents

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

TBD

4.5.3.1.5 Test requirement

Table 4.5.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.5.3.1.5-1: Cell specific test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle

Parameter		Unit	Cell 2			Cell 3		
			T1	T2	T3	T1	T2	T3
SSB ARFCN			freq1			freq1		
Duplex mode	Config 1,4		FDD					
	Config 2,3,5,6		TDD					
TDD configuration	Config 1,4		Not Applicable					
	Config 2,5		TDDConf.1.1					
	Config 3,6		TDDConf.1.2					
$BW_{channel}$	Config 1,4	MHz	10: $N_{RB,c}$ = 52					
	Config 2,5		10: $N_{RB,c}$ = 52					
	Config 3,6		40: $N_{RB,c}$ = 106					
BWP BW	Config 1,4		10: $N_{RB,c}$ = 52					
	Config 2,5		10: $N_{RB,c}$ = 52					
	Config 3,6		40: $N_{RB,c}$ = 106					
DRx Cycle		ms	Not Applicable					
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD			SR.1.1 FDD		
	Config 2,5		SR.1.1 TDD			SR.1.1 TDD		
	Config 3,6		SR2.1 TDD			SR2.1 TDD		
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD			CR.1.1 FDD		
	Config 2,5		CR.1.1 TDD			CR.1.1 TDD		
	Config 3,6		CR2.1 TDD			CR2.1 TDD		

RMC CORESET Reference Channel	Config 1,4		CCR.1.1 FDD	CCR.1.1 FDD
	Config 2,5		CCR.1.1 TDD	CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD	CCR.2.1 TDD
OCNG Patterns			OCNG pattern 1	
SMTC configuration			SMTC.1	
SSB configuration	Config 1,2,4,5		SSB.1 FR1	
	Config 3,6		SSB.2 FR1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5	kHz	15 kHz	
	Config 3,6		30kHz	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS (note 1)				
EPRE ratio of OCNG to OCNG DMRS (note 1)				
N_{oc} note 2		dBm/15kHz	[-104]+TT	
N_{oc} note 2	Config 1,2,4,5	dBm/SCS	[-104] +TT	
	Config 3,6		[-101] +TT	
$\hat{E}_s/I_{ot}$		dB	[17] +TT	
$\hat{E}_s/N_{oc}$		dB	[17] +TT	
SS-RSRP note 3	Config 1,2,4,5	dBm/SCS	[-87] +TT	
	Config 3,6		[-84] +TT	
SCH_RP note 3		dBm/15 kHz	[-87] +TT	
Propagation condition		-	AWGN	

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

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

NOTE 3: SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.]

During T2 the UE shall send the first CSI report for SCell in a slot (m+k), or in a slot (m+1+[T_{HARQ}+3ms+T_{SSB_max}+$T_{SMTC\_duration}$]+1) as defined in TS 38.133 [6] section 8.3 if the slot (m+k) was subject to interruption. Whether CSI report in slot (m+k) was interrupted or not is checked by monitoring ACK/NACK sent in PCell in slot (m+k).

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot (m+T_{HARQ}+$T_{activation\_time}$+$T_{CSI\_Reporting}$), $T_{activation\_time}$ = [3ms+T_{SMTC_SCell}+2ms], as defined in TS 38.133 [6] section 8.3.

During T3 the UE shall stop sending CSI reports for SCell at latest in a slot (n+[T_{HARQ}+3ms]), as defined in TS 38.133 [6] section 8.3.

During T2 interruption of PCell / PSCell during SCell activation shall not happen outside the slot (m+1+[T_{HARQ}]) to (m+1+[T_{HARQ}+3ms+T_{SSB_max}+$T_{SMTC\_duration}$]), as defined in TS 38.133 [6] section 8.3.

During T3 interruption of PCell / PSCell during SCell deactivation shall not happen outside the slot (n+1+[T_{HARQ}]) to (n+1+[T_{HARQ}+3ms]), as defined in TS 38.133 [6] section 8.3.

The interruption of PSCell shall not be more than the values specified for EN-DC in TS 38.133 [6] section 8.2.1.2.4.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot (m+T_{HARQ}+$T_{activation\_time}$+$T_{CSI\_Reporting}$) as defined in TS 38.133 [6] section 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

4.5.3.2 EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 320ms SCell measurement cycle

Editor's notes: This clause is incomplete, the following items are TBD

- *test cases depends on completion from TC4.5.3.1*
- *Test tolerance analysis is missing;*
- *Test procedure; Message content; Test requirement;*
- *Test applicability Table in TS38.522 need to be updated.*

4.5.3.2.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements, when the SCell in FR1 is known by the UE at the time of activation.

4.5.3.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.5.3.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.3.2.

4.5.3.2.4 Test description

4.5.3.2.4.1 Initial conditions

Same initial conditions as described in section 4.5.3.1.4.1 with following exception:

- The supported test configurations is replaced by Table 4.5.3.2.4.1-1.

- The listed parameter values in Tables 4.5.3.2.4.1-2 will replace the values of corresponding parameters in Tables 4.5.3.1.4.1-3.

Table 4.5.3.2.4.1-1: supported test configurations

Test Case ID	Description
4.5.3.2-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.3.2-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.3.2-3	LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.3.2-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.3.2-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.3.2-6	LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations	

Table 4.5.3.2.4.1-2: General test parameters for known FR1 SCell activation case, 320ms SCell measurement cycle

Parameter	Unit	Value	Comment
SCell measurement cycle (measCycleSCell)	ms	320	

4.5.3.2.4.2 Test procedure

Same test procedure as described in section 4.5.3.1.4.2 with following exception:

- TBD

4.5.3.2.4.3 Message contents

Same message contents as described in section 4.5.3.1.4.3 with following exception:

- TBD

4.5.3.2.5 Test requirement

Table 4.5.3.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.5.3.2.5-1: Cell specific test parameters for known FR1 SCell activation case, 320ms SCell measurement cycle

Parameter		Unit	Cell 2			Cell 3		
			T1	T2	T3	T1	T2	T3
SSB ARFCN			freq1			freq1		
Duplex mode	Config 1,4		FDD					
	Config 2,3,5,6		TDD					
TDD configuration	Config 1,4		Not Applicable					
	Config 2,5		TDDConf.1.1					
	Config 3,6		TDDConf.1.2					
$BW_{channel}$	Config 1,4	MHz	10: $N_{RB,c}$ = 52					
	Config 2,5		10: $N_{RB,c}$ = 52					
	Config 3,6		40: $N_{RB,c}$ = 106					
BWP BW	Config 1,4		10: $N_{RB,c}$ = 52					
	Config 2,5		10: $N_{RB,c}$ = 52					
	Config 3,6		40: $N_{RB,c}$ = 106					
DRx Cycle		ms	Not Applicable					
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD			SR.1.1 FDD		
	Config 2,5		SR.1.1 TDD			SR.1.1 TDD		
	Config 3,6		SR2.1 TDD			SR2.1 TDD		
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD			CR.1.1 FDD		
	Config 2,5		CR.1.1 TDD			CR.1.1 TDD		
	Config 3,6		CR2.1 TDD			CR2.1 TDD		
RMC CORESET Reference Channel	Config 1,4		CCR.1.1 FDD			CCR.1.1 FDD		
	Config 2,5		CCR.1.1 TDD			CCR.1.1 TDD		
	Config 3,6		CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Patterns			OCNG pattern 1					
SMTC configuration			SMTC.1					
SSB configuration	Config 1,2,4,5		SSB.1 FR1					
	Config 3,6		SSB.2 FR1					
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5	kHz	15 kHz					
	Config 3,6		30kHz					
EPRE ratio of PSS to SSS		dB	0					
EPRE ratio of PBCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS								
EPRE ratio of PDCCH DMRS to SSS								
EPRE ratio of PDCCH to PDCCH DMRS								
EPRE ratio of PDSCH DMRS to SSS								
EPRE ratio of PDSCH to PDSCH								
EPRE ratio of OCNG DMRS to SSS (note 1)								
EPRE ratio of OCNG to OCNG DMRS (note 1)								
N_{oc} note 2		dBm/15kHz	[-104]+TT					
N_{oc} note 2	Config 1,2,4,5	dBm/SCS	[-104] +TT					
	Config 3,6		[-101] +TT					
$\hat{E}_s/I_{ot}$		dB	[17] +TT					
$\hat{E}_s/N_{oc}$		dB	[17] +TT					
SS-RSRP note 3	Config 1,2,4,5	dBm/SCS	[-87] +TT					
	Config 3,6		[-84] +TT					
SCH_RP note 3		dBm/15 kHz	[-87] +TT					
Propagation condition		-	AWGN					

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.]

During T2 the UE shall send the first CSI report for SCell in a slot (m+k), or in a slot (m+1+[T_{HARQ}+3ms+T_{SSB_max}+$T_{SMTC\_duration}$]+1) as defined in TS 38.133 [6] section 8.3 if the slot (m+k) was subject to interruption. Whether CSI report in slot (m+k) was interrupted or not is checked by monitoring ACK/NACK sent in PCell in slot (m+k).

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot (m+T_{HARQ}+$T_{activation\_time}$+$T_{CSI\_Reporting}$), $T_{activation\_time}$ = [3ms+T_{SMTC_MAX}+T_{SMTC_SCell}+2ms], as defined in TS 38.133 [6] section 8.3.

During T3 the UE shall stop sending CSI reports for SCell at latest in a slot (n+[T_{HARQ}+3ms]), as defined in TS 38.133 [6] section 8.3.

During T2 interruption of PCell / PSCell during SCell activation shall not happen outside the slot (m+1+[T_{HARQ}]) to (m+1+[T_{HARQ}+3ms+T_{SSB_max}+$T_{SMTC\_duration}$]), as defined in TS 38.133 [6] section 8.3.

During T3 interruption of PCell / PSCell during SCell deactivation shall not happen outside the slot (n+1+[T_{HARQ}]) to (n+1+[T_{HARQ}+3ms]), as defined in TS 38.133 [6] section 8.3.

The interruption of PSCell shall not be more than the values specified for EN-DC in TS 38.133 [6] section 8.2.1.2.4.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot (m+T_{HARQ}+$T_{activation\_time}$+$T_{CSI\_Reporting}$) as defined in TS 38.133 [6] section 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

4.5.3.3 EN-DC FR1 SCell activation and deactivation of unknown SCell in non-DRX

Editor's notes: This clause is incomplete, the following items are TBD

- *test cases depends on completion from TC4.5.3.1;*
- *The core requirements in TS 38.133 are between [.] or TBD;*
- *Test tolerance analysis is missing;*
- *Test procedure and Message content are TBD;*
- *Cell mapping and Connection diagram is TBD;*
- *Test applicability Table in TS38.522 need to be updated.*

4.5.3.3.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements, when the SCell in FR1 is unknown by the UE at the time of activation.

4.5.3.3.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.5.3.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.3.3.

4.5.3.3.4 Test description

4.5.3.3.4.1 Initial conditions

Same initial conditions as described in section 4.5.3.1.4.1 with following exception:

- The supported test configurations is replaced by Table 4.5.3.3.4.1-1.
- The listed parameter values in Tables 4.5.3.3.4.1-2 will replace the values of corresponding parameters in Tables 4.5.3.1.4.1-3.

Table 4.5.3.3.4.1-1: supported test configurations

Test Case ID	Description
4.5.3.3-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.3.3-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.3.3-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.3.3-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.3.3-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.3.3-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations	

Table 4.5.3.3.4.1-2: General test parameters for unknown FR1 SCell activation case, 160ms SCell measurement cycle

Parameter	Unit	Value	Comment
T1	ms	[100]	During this time the PSCell shall be known and the SCell configured, but not detected.

4.5.3.3.4.2 Test procedure

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, E-UTRA has one cell, NR has two cells. Cell 1 and Cell 2 have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRAN and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

During T2 the Test procedure requires the UE to send the first CSI report for SCell1 in a subframe (m+[k]), but also allows a subframe not happen outside the slot (m+1+[T_{HARQ}]) to (m+1+[T_{HARQ}+3ms+T_{SSB_max}+$T_{SMTC\_duration}$]) if the subframe (m+[k]) was subject to interruption. The SS determines whether the CSI report in subframe (m+[k]) was interrupted or not by monitoring ACK/NACK sent in PSCell in subframe (m+[k]).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG according to TS 38.508-1 [14] clause 4.5.
2. TBD.

4.5.3.3.4.3 Message contents

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

TBD

4.5.3.3.5 Test requirement

Table 4.5.3.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.5.3.3.5-1: Cell specific test parameters for unknown FR1 SCell activation case

Parameter		Unit	Cell 2			Cell 3		
			T1	T2	T3	T1	T2	T3
SSB ARFCN			freq1			freq1		
Duplex mode	Config 1,4		FDD					
	Config 2,3,5,6		TDD					
TDD configuration	Config 1,4		Not Applicable					
	Config 2,5		TDDConf.1.1					
	Config 3,6		TDDConf.1.2					
$BW_{channel}$	Config 1,4	MHz	10: $N_{RB,c}$ = 52					
	Config 2,5		10: $N_{RB,c}$ = 52					
	Config 3,6		40: $N_{RB,c}$ = 106					
BWP BW	Config 1,4		10: $N_{RB,c}$ = 52					
	Config 2,5		10: $N_{RB,c}$ = 52					
	Config 3,6		40: $N_{RB,c}$ = 106					
DRx Cycle		ms	Not Applicable					
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD			SR.1.1 FDD		
	Config 2,5		SR.1.1 TDD			SR.1.1 TDD		
	Config 3,6		SR2.1 TDD			SR2.1 TDD		
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD			CR.1.1 FDD		
	Config 2,5		CR.1.1 TDD			CR.1.1 TDD		
	Config 3,6		CR2.1 TDD			CR2.1 TDD		
RMC CORESET Reference Channel	Config 1,4		CCR.1.1 FDD			CCR.1.1 FDD		
	Config 2,5		CCR.1.1 TDD			CCR.1.1 TDD		
	Config 3,6		CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Patterns			OCNG pattern 1					
SMTC configuration			SMTC.1					
SSB configuration	Config 1,2,4,5		SSB.1 FR1					
	Config 3,6		SSB.2 FR1					
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5	kHz	15 kHz					
	Config 3,6		30kHz					
EPRE ratio of PSS to SSS		dB	0					
EPRE ratio of PBCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS								
EPRE ratio of PDCCH DMRS to SSS								
EPRE ratio of PDCCH to PDCCH DMRS								
EPRE ratio of PDSCH DMRS to SSS								
EPRE ratio of PDSCH to PDSCH								
EPRE ratio of OCNG DMRS to SSS (note 1)								
EPRE ratio of OCNG to OCNG DMRS (Note 1)								
N_{oc} note 2		dBm/15kHz	[-104]+TT					
N_{oc} note 2	Config 1,2,4,5	dBm/SCS	[-104] +TT					
	Config 3,6		[-101] +TT					
$\hat{E}_s/I_{ot}$		dB	[17] +TT					
$\hat{E}_s/N_{oc}$		dB	[17] +TT					
SS-RSRP note 3	Config 1,2,4,5	dBm/SCS	[-87] +TT					
	Config 3,6		[-84] +TT					
SCH_RP note 3		dBm/15 kHz	[-87] +TT					
Propagation condition		-	AWGN					

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.]

During T2 the UE shall send the first CSI report for SCell in a slot (m+k), or in a slot (m+1+[T_{HARQ}+3ms+T_{SSB_max}+$T_{SMTC\_duration}$]+1) as defined in TS 38.133 [6] section 8.3 if the slot (m+k) was subject to interruption. Whether CSI report in slot (m+k) was interrupted or not is checked by monitoring ACK/NACK sent in PCell in slot (m+k).

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot (m+T_{HARQ}+$T_{activation\_time}$+$T_{CSI\_Reporting}$), $T_{activation\_time}$ = [3ms+2*T_{SMTC_MAX}+2*T_{SMTC_SCell}+2ms], as defined in TS 38.133 [6] section 8.3.

During T3 the UE shall stop sending CSI reports for SCell at latest in a slot (n+[T_{HARQ}+3ms]), as defined in TS 38.133 [6] section 8.3.

During T2 interruption of PCell / PSCell during SCell activation shall not happen outside the slot (m+1+[T_{HARQ}]) to (m+1+[T_{HARQ}+3ms+T_{SSB_max}+$T_{SMTC\_duration}$]), as defined in TS 38.133 [6] section 8.3.

During T3 interruption of PCell / PSCell during SCell deactivation shall not happen outside the slot (n+1+[T_{HARQ}]) to (n+1+[T_{HARQ}+3ms]), as defined in TS 38.133 [6] section 8.3.

The interruption of PSCell shall not be more than the values specified for EN-DC in TS 38.133 [6] section 8.2.1.2.4.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot (m+T_{HARQ}+$T_{activation\_time}$+$T_{CSI\_Reporting}$) as defined in TS 38.133 [6] section 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

4.5.4 UE UL carrier RRC reconfiguration delay

4.5.5 Link recovery procedures

4.5.6 Active BWP switch delay

4.5.6.1 DCI-based and time-based active BWP switch

4.5.6.1.0 Minimum conformance requirements

FFS

4.5.6.1.1 EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

4.5.6.1.1.1 Test purpose

FFS

4.5.6.1.1.2 Test applicability

FFS

4.5.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.6.1.1.

4.5.6.1.1.4 Test description

4.5.6.1.1.4.1 Initial conditions

FFS

4.5.6.1.1.4.2 Test procedure

FFS

4.5.6.1.1.4.3 Message contents

FFS

4.5.6.1.1.5 Test requirements

FFS

4.5.6.1.2 EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

4.5.6.1.2.1 Test purpose

FFS

4.5.6.1.2.2 Test applicability

FFS

4.5.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.6.1.2.

4.5.6.1.2.4 Test description

4.5.6.1.2.4.1 Initial conditions

FFS

4.5.6.1.2.4.2 Test procedure

FFS

4.5.6.1.2.4.3 Message contents

FFS

4.5.6.1.2.5 Test requirements

FFS

4.5.6.2 RRC-based active BWP switch

4.5.6.2.0 Minimum conformance requirements

FFS

4.5.6.2.1 EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

4.5.6.2.1.1 Test purpose

FFS

4.5.6.2.1.2 Test applicability

FFS

4.5.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.6.2.1.

4.5.6.2.1.4 Test description

4.5.6.2.1.4.1 Initial conditions

FFS

4.5.6.2.1.4.2 Test procedure

FFS

4.5.6.2.1.4.3 Message contents

FFS

4.5.6.2.1.5 Test requirements

FFS

4.6 Measurement procedures

4.6.1 Intra-frequency measurements

4.6.1.0 Minimum conformance requirements

4.6.1.0.1 Minimum conformance requirements for event-triggered reporting without gap

Editor's Note: The requirements below have been derived without considering gap sharing when all SMTC occasion are fully overlapping with measurement gaps.

The UE shall be able to identify a new detectable intra frequency cell within $T_{identify\_intra\_without\_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within $T_{identify\_intra\_with\_index}$. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within $T_{identify\_intra\_without\_index}$. It is assumed that *deriveSSB-IndexFromCell*is always enabled for FR1 TDD and FR2.

$$T_{identify\_intra\_without\_index} = (T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra})\ ms$$

$$T_{identify\_intra\_with\_index} = (T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra} + T_{SSB\_time\_index\_intra})\ ms$$

Where:

T_{PSS/SSS_sync_intra}: it is the time period used in PSS/SSS detection given in table 4.6.1.0.1-1, 4.6.1.0.1-2, 4.6.1.0.1-4 (deactivated Scell) or 4.6.1.0.1-5 (deactivated SCell)

$T_{SSB\_time\_index\_intra}$: it is the time period used to acquire the index of the SSB being measured given in table 4.6.1.0.1-3 or 4.6.1.0.1-6 (deactivated SCell)

$T_{SSB\_measurement\_period\_intra}$: equal to a measurement period of SSB based measurement given in table 4.6.1.0.1-7, table 4.6.1.0.1-8 table 4.6.1.0.1-9 (deactivated Scell) or 4.6.1.0.1-10(deactivated SCell)

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{outside\_gap,i}$ in TS 38.133 [6] section 9.1.5.1 for measurement conducted outside measurement gaps or according to $CSSF_{within\_gap,i}$ in TS 38.133 [6] section 9.1.5.2 for measurement conducted within measurement gaps.

$M_{pss/sss\_sync\_w/o\_gaps}$: For a UE supporting FR2 power class 1(fixed wireless access), M_{pss/sss_sync}=40. For a UE supporting power class 2(vehicle mounted), $M_{pss/sss\_sync\_w/o\_gaps}$ =24. For a UE supporting FR2 power class 3(handheld), $M_{pss/sss\_sync\_w/o\_gaps}$ =24. For a UE supporting FR2 power class 4, $M_{pss/sss\_sync\_w/o\_gaps}$ = [24]

$M_{meas\_period\_w/o\_gaps}$: For a UE supporting power class 1 (fixed wireless access), $M_{meas\_period\_w/o\_gaps}$ =40. For a UE supporting FR2 power class 2 (vehicle mounted), $M_{meas\_period\_w/o\_gaps}$ =24. For a UE supporting power class 3 (handheld), $M_{meas\_period\_w/o\_gaps}$ =24. For a UE supporting power class 4, $M_{meas\_period\_w/o\_gaps}$ = [24].

When intrafrequency SMTC is fully non overlapping with measurement gaps, Kp=1

When intrafrequency SMTC is partially overlapping with measurent gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP

If the higher layer signaling in TS38.331 [13] signaling of *smtc2* is present and smtc1 is fully overlapping with measurement and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{identify\_intra\_without\_index}$ or $T_{identify\_intra\_with\_index}$

For FR2 when RLM-RS outside measurement gap is fully overlapping with intra-frequency SMTC, K_{RLM}= 1.5, otherwise K_{RLM}=1.

Editor's note: It is FFS how requirements are defined for the case that SMTC are fully overlapping with measurement gap

If SCG DRX is in use, intrafrequency cell identification requirements specified in Table 4.6.1.0.1-1, Table 4.6.1.0.1-2, Table 4.6.1.0.1-3, Table 4.6.1.0.1-4, Table 4.6.1.0.1-5 and Table 4.6.1.0.1-6 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 4.6.1.0.1-1: Time period for PSS/SSS detection, (Frequency range FR1)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max[600ms, ceil([5] x K_p) x SMTC period] note 1 x $CSSF_{intra}$
DRX cycle≤ 320ms	max[600ms, ceil(1.5x [5] x K_p) x max(SMTC period,DRX cycle)] x $CSSF_{intra}$
DRX cycle>320ms	Ceil([5] x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified.	

Table 4.6.1.0.1-2: Time period for PSS/SSS detection, (Frequency range FR2)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max[600ms, ceil($M_{pss/sss\_sync\_w/o\_gaps}$ x K_p x K_{RLM}) x SMTC period] note 1 x $CSSF_{intra}$
DRX cycle≤ 320ms	max[600ms, ceil(1.5 x $M_{pss/sss\_sync\_w/o\_gaps}$ x K_p x K_{RLM}) x max(SMTC period,DRX cycle)] x $CSSF_{intra}$
DRX cycle>320ms	Ceil($M_{pss/sss\_sync\_w/o\_gaps}$ x K_p x K_{RLM}) x DRX cycle x $CSSF_{intra}$
...	...
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified.	

Table 4.6.1.0.1-3: Time period for time index detection (Frequency range FR1)

DRX cycle	$T_{SSB\_time\_index\_intra}$
No DRX	max[120ms, ceil(3 x K_p) x SMTC period] note 1 x $CSSF_{intra}$
DRX cycle≤ 320ms	max[120ms, ceil (1.5 x 3 x K_p) x max(SMTC period,DRX cycle)] x $CSSF_{intra}$
DRX cycle>320ms	Ceil(3 x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified.	

Table 4.6.1.0.1-4: Time period for PSS/SSS detection, deactivated SCell (Frequency range FR1)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	[5] x measCycleSCell x $CSSF_{intra}$
DRX cycle≤ 320ms	[5] x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$
DRX cycle> 320ms	[5] x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$

Table 4.6.1.0.1-5: Time period for PSS/SSS detection, deactivated SCell (Frequency range FR2)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	$M_{pss/sss\_sync\_w/o\_gaps}$ x measCycleSCell x $CSSF_{intra}$
DRX cycle≤ 320ms	$M_{pss/sss\_sync\_w/o\_gaps}$ x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$
DRX cycle> 320ms	$M_{pss/sss\_sync\_w/o\_gaps}$ x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$

Table 4.6.1.0.1-6: Time period for time index detection, deactivated SCell (Frequency range FR1)

DRX cycle	$T_{SSB\_time\_index\_intra}$
No DRX	[3] x measCycleSCell x $CSSF_{intra}$
DRX cycle≤ 320ms	[3] x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$
DRX cycle> 320ms	[3] x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$

Editor's Note :The requirements below have been derived so far assuming no configured Scell or E-UTRA SCell. The requirements when one or more SCells or E-UTRA SCells are configured is for further study. The requirements below have been derived without considering gap sharing when all SMTC occasion are fully overlapping with measurement gaps.

The measurement period for intrafrequency measurements without gaps is as shown in table 4.6.1.0.1-7, 4.6.1.0.1-8, 4.6.1.0.1-9 (deactivated SCell) or 4.6.1.0.1-10 (deactivated SCell). If the higher layer signaling in TS38.331 [13] signaling of *smtc2* is present and smtc1 is fully overlapping with measurement and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{SSB\_measurement\_period\_intra}$.

If SCG DRX is in use, intrafrequency measurement period requirements specified in Table 4.6.1.0.1-7, Table 4.6.1.0.1-8, Table 4.6.1.0.1-9 and Table 4.6.1.0.1-10 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 4.6.1.0.1-7: Measurement period for intrafrequency measurements without gaps(Frequency FR1)

DRX cycle	$T_{SSB\_measurement\_period\_intra}$
No DRX	max[200ms, ceil(5 x K_p) x SMTC period] $^{note\ 1}$ x $CSSF_{intra}$
DRX cycle≤ 320ms	max[200ms, ceil(1.5x 5 x K_p) x max(SMTC period,DRX cycle)] x $CSSF_{intra}$
DRX cycle>320ms	ceil(5 x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified.	

Table 4.6.1.0.1-8: Measurement period for intrafrequency measurements without gaps(Frequency FR2)

DRX cycle	$T_{SSB\_measurement\_period\_intra}$
No DRX	max[400ms, ceil($M_{meas\_period\_w/o\_gaps}$ x K_p x K_{RLM}) x SMTC period] $^{note\ 1}$ x $CSSF_{intra}$
DRX cycle≤ 320ms	max[400ms, ceil(1.5x $M_{meas\_period\_w/o\_gaps}$ x K_p x K_{RLM}) x max(SMTC period,DRX cycle)] x $CSSF_{intra}$
DRX cycle>320ms	ceil($M_{meas\_period\_w/o\_gaps}$ xK_p x K_{RLM}) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified.	

Table 4.6.1.0.1-9: Measurement period for intrafrequency measurements without gaps (deactivated SCell) (Frequency range FR1)

DRX cycle	$T_{SSB\_measurement\_period\_intra}$
No DRX	[5] x measCycleSCell x $CSSF_{intra}$
DRX cycle≤ 320ms	[5] x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$
DRX cycle> 320ms	[5] x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$

Table 4.6.1.0.1-10: Measurement period for intrafrequency measurements without gaps (deactivated SCell) (Frequency range FR2)

DRX cycle	$T_{SSB\_measurement\_period\_intra}$
No DRX	$M_{meas\_period\ with\_gaps}$ x measCycleSCell x $CSSF_{intra}$
DRX cycle≤ 320ms	$M_{meas\_period\ with\_gaps}$ x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$
DRX cycle> 320ms	$M_{meas\_period\ with\_gaps}$ x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$

The normative reference for this requirement is TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2.

4.6.1.0.2 Minimum conformance requirements for event-triggered measurements with gap

TS 38.133, clause 9.2.2]

The requirements in Section 9.2 apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in Sections 10.1.2 and 10.1.3 for FR1 and FR2, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in Sections 10.1.7 and 10.1.8 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in Sections 10.1.12 and 10.1.13 for FR1 and FR2, respectively, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding Band.

[TS 38.133, clause 9.2.6.2]

The UE shall be able to identify a new detectable intra frequency cell within $T_{identify\_intra\_without\_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within $T_{identify\_intra\_with\_index.}$ The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within $T_{identify\_intra\_without\_index.}$ It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify\_intra\_without\_index} = T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra} \text{ ms}$$

$$T_{identify\_intra\_with\_index} = T_{PSS/SSS\_sync\_ntra} + T_{SSB\_measurement\_period\_intra} + T_{SSB\_time\_index\_intra}$$

Where:

T_{PSS/SSS_sync_intra}: it is the time period used in PSS/SSS detection given in table 9.2.6.2-1 or 9.2.6.2-2.

$T_{SSB\_time\_index\_intra}$: it is the time period used to acquire the index of the SSB being measured given in table 9.2.6.2-3.

$T_{SSB\_measurement\_period\_intra}$: equal to a measurement period of SSB based measurement given in table 9.2.6.2-1 or 9.2.6.2-2.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within\_gap,i}$ in section [9.1.5.2] for measurement conducted within measurement gaps.

$M_{pss/sss\_sync\_with\_gaps}$: For a UE supporting FR2 power class 1(fixed wireless access), $M_{pss/sss\_sync\ with\_gaps}$=40. For a UE supporting FR2 power class 2(vehicle mounted), $M_{pss/sss\_sync\ with\_gaps}$ =24. For a UE supporting FR2 power class 3(handheld), $M_{pss/sss\_sync\ with\_gaps}$ =24. For a UE supporting power class 4, $M_{pss/sss\_sync\ with\_gaps}$ =[24]

$M_{meas\_period\_ with\_gaps}$: For a UE supporting power class 1(fixed wireless access), $M_{meas\_period\_ with\_gaps}$ =40. For a UE supporting power class 2(vehicle mounted), $M_{meas\_period\_ with\_gaps}$ =24. For a UE supporting power class 3(handheld), $M_{meas\_period\_ with\_gaps}$ =24. For a UE supporting power class 4, $M_{meas\_period\ with\_gaps}$ =[24].

If SCG DRX is in use, intrafrequency cell identification requirements specified in Table 9.2.6.1-1, Table 9.2.6.1-2, and Table 9.2.5.1-3 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 9.2.6.2-1: Time period for PSS/SSS detection (Frequency range FR1)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max[600ms, [5] x max(MGRP, SMTC period)] x $CSSF_{intra}$
DRX cycle≤ 320ms	max[600ms, ceil(1.5x [5]) x max(MGRP, SMTC period,DRX cycle)] x $CSSF_{intra}$
DRX cycle>320ms	[5] x max(MGRP, DRX cycle) x $CSSF_{intra}$

Table 9.2.6.2-3: Time period for time index detection (Frequency range FR1)

DRX cycle	$T_{SSB\_time\_index\_intra}$
No DRX	max[120ms, 3 x max(MGRP, SMTC period]) x $CSSF_{intra}$
DRX cycle≤ 320ms	max[120ms, ceil(1.5x 3) x max(MGRP, SMTC period,DRX cycle) x $CSSF_{intra}$]
DRX cycle>320ms	3 x max(MGRP, DRX cycle) x $CSSF_{intra}$

[TS 38.133, clause 9.2.6.3]

The measurement period for FR1 intrafrequency measurements with gaps is as shown in table 9.2.6.3-1.

The measurement period for FR2 intrafrequency measurements with gaps is as shown in table 9.2.6.3-2 .

If SCG DRX is in use, intrafrequency measurement period requirements specified in Table 9.2.6.3-1and Table 9.2.6.3-2, shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Editor’s note: The values of X, Y and N in the following tables are to be updated.

Table 9.2.6.3-1: Measurement period for intrafrequency measurements with gaps(Frequency Range FR1)

DRX cycle	$T_{SSB\_measurement\_period\_intra}$
No DRX	max[200ms, 5 x max(MGRP, SMTC period)] x $CSSF_{intra}$
DRX cycle≤ 320ms	max[200ms, ceil(1.5x 5) x max(MGRP, SMTC period,DRX cycle)] x $CSSF_{intra}$
DRX cycle>320ms	5 x max(MGRP, DRX cycle) x $CSSF_{intra}$

[TS 38.133, clause 9.2.4.3]

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in sections 10.1.2.1, 10.1.3.1, 10.1.7.1, 10.1.8.1, 10.1.12.1 and 10.1.13.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resoureces for UE to send the measurement repor

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{\text{identify intra with index}}$ or $T_{\text{identify intra without index}}$ defined in clause 9.2.5.1 or clause 9.2.6.2. When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{\text{identify intra without index}}$ or $T_{\text{identify intra with index}}$ defined in clause 9.2.5.1 or clause 9.2.6.2 becomes undetectable for a period and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than $T_{\text{Measurement\_Period, Intra}}$ provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [4] clause 9.2.2, 9.2.5.1, 9.2.5.2 and 9.2.4.3.

4.6.1.1 EN-DC FR1 event-triggered reporting without gap in non-DRX

Editor's notes: This clause is incomplete, the following items are TBD

- *The core requirements in TS 38.133 are between [.] or TBD;*
- *Message content is TBD;*
- *Test procedure still keep [] and pending by RAN4;*
- *Cell mapping is TBD;*
- *Test applicability Table in TS38.522 need to be updated.*

4.6.1.1.1 Test purpose

This test is to verify the UE makes correct reporting of an event without gap within the intra-frequency cell search requirements.

4.6.1.1.2 Test applicability

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

4.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.1.

4.6.1.1.4 Test description

4.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.1.1.4.1-1.

Table 4.6.1.1.4.1-1: supported test configurations

Test Case ID	Description
4.6.1.1-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.1.1-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.1.1-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.1.4.1-2 and Table 4.6.1.1.4.1-3.

Table 4.6.1.1.4.1-2: Initial conditions for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.1.2-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 2 and φ_1 = 0 Hz	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

Table 4.6.1.1.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1

Parameter	Unit	Test configuration	Value	Comment
Active cell		1, 2, 3	E-UTRAN Cell 1 and NR Cell 2	
Neighbour cell		1, 2, 3	NR Cell 3	Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 2: Cell 2 and Cell 3	
SSB configuration		1	SSB.1 FR1	
		2	SSB.1 FR1	
		3	SSB.2 FR1	
SMTC configuration		1	SMTC pattern 2	
		2	SMTC pattern 1	
		3	SMTC pattern 1	
A3-Offset	dB	1, 2, 3	-4.5	
CP length		1, 2, 3	Normal	
Hysteresis	dB	1, 2, 3	0	
Time To Trigger	s	1, 2, 3	0	
Filter coefficient		1, 2, 3	0	L3 filtering is not used
DRX		1, 2, 3		OFF
Time offset between PCell and PSCell		1, 2, 3	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 μs	Synchronous cells
		3	3 μs	Synchronous cells
T1	s	1, 2, 3	5	
T2	s	1, 2, 3	5	

1. Message contents are defined in clause 4.6.1.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the neighbour NR Cell.

4.6.1.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG and SCG according to Annex C.1 for all downlink physical channels.

3. The SS shall configure the PCell (Cell 1) and PSCell (Cell 2) on the MCG and SCG as per TS 38.508-1 [14] clause 4.5 with the message content exceptions defined in clause 4.6.1.1.4.3.

4. Set the parameters according to T1 in Table 4.6.1.1.4.1-2. Propagation conditions are set according to Annex C clauses C.2.2. T1 starts.

5. The SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.

6. The UE shall transmit an RRCConnectionReconfigurationComplete message.

7. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.1.4.1-2.

8. UE shall transmit a MeasurementReport message triggered by Event A3 for Cell 3 on PCell (Cell 1). If the measurement reporting delay from the beginning of time period T2 is less than [802] the number of successful tests is increased by one. If the UE fails to report the event within the measurement reporting delay requirement then the number of failure tests is increased by one.

9. After the SS receives the MeasurementReport message in step 9 or when T2 expires, the SS shall transmit a RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

10. Set Cell 3 physical cell identity = [((current cell 3 physical cell identity + 1) mod 14 + 2)] for next iteration of the test procedure loop.

11. After the RRC connection release, the SS:
    - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5.
    or
    - if paging fails, switches off and on the UE and ensures the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG according to TS 38.508-1 [14] clause 4.5

12. Repeat steps 3-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.1.1.4.3 Message contents

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

TBD

4.6.1.1.5 Test requirement

Table 4.6.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.1.1.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
TDD configuration		1	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns		1, 2, 3	OP.1		OP.1	
Intial BWP configuration		1, 2, 3	DLBWP.0 ULBWP.0		DLBWP.0 ULBWP.0	
Active DL BWP configuration		1, 2, 3	DLBWP.1		DLBWP.1	
Active UL BWP configuration		1, 2, 3	ULBWP.1		ULBWP.1	
RLM-RS		1, 2, 3	SSB		SSB	
N_{oc} note 2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} note 2	dBm/15 KHz	1	-98			
		2				
		3				
$\hat{E}_s/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
		2				
		3				
SS-RSRP note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/9.36 MHz	1	-64.60	-62.25	-Infinity	-62.25
	dBm/9.36 MHz	2	-64.60	-62.25	-Infinity	-62.25
	dBm/38.16 MHz	3	-58.50	-56.16	-Infinity	-56.16
Propagation Condition		1, 2, 3	AWGN			

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

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

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

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [800] ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.1.2 EN-DC FR1 event-triggered reporting without gap in DRX

Editor's notes: This clause is incomplete, the following items are TBD

- *The core requirements in TS 38.133 are between [.] or TBD;*
- *Message content is TBD;*
- *Test procedure still keep [] and pending by RAN4;*
- *Cell mapping and Connection diagram is TBD;*
- *Test applicability Table in TS38.522 need to be updated.*

4.6.1.2.1 Test purpose

This test is to verify the UE makes correct reporting of an event without gap in DRX within the intra-frequency cell search requirements.

4.6.1.2.2 Test applicability

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

4.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.2.

4.6.1.2.4 Test description

4.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.1.2.4.1-1.

Table 4.6.1.2.4.1-1: supported test configurations

Test Case ID	Description
4.6.1.2-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.1.2-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.1.2-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.2.4.1-2 and Table 4.6.1.2.4.1-3.

Table 4.6.1.2.4.1-2: Initial conditions for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.1.2-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 2 and φ_1 = 0 Hz	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

Table 4.6.1.2.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
Active cell		1, 2, 3	E-UTRAN Cell 1 and NR Cell 2		
Neighbour cell		1, 2, 3	NR Cell 3		Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 2: Cell 2 and Cell 3		
SSB configuration		1	SSB.1 FR1		
		2	SSB.1 FR1		
		3	SSB.2 FR1		
SMTC configuration		1	SMTC pattern 2		
		2	SMTC pattern 1		
		3	SMTC pattern 1		
A3-Offset	dB	1, 2, 3	-4.5		
CP length		1, 2, 3	Normal		
Hysteresis	dB	1, 2, 3	0		
Time To Trigger	s	1, 2, 3	0		
Filter coefficient		1, 2, 3	0		L3 filtering is not used
DRX	ms	1, 2, 3	40	640	
Time offset between PCell and PSCell		1, 2, 3	3 μs		Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 μs		Synchronous cells
		3	3 μs		Synchronous cells
T1	s	1, 2, 3	5		
T2	s	1, 2, 3	5	10	

1. Message contents are defined in clause 4.6.1.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the neighbour NR Cell.

4.6.1.2.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG according to TS 38.508-1 [14] clause 4.5.
2. Configure MCG and SCG according to Annex C.1 for all downlink physical channels.
3. The SS shall configure the PCell (Cell 1) and PSCell (Cell 2) on the MCG and SCG as per TS 38.508-1 [14] clause 4.5 with the message content exceptions defined in clause 4.6.1.2.4.3.
4. Set the parameters according to T1 in Table 4.6.1.1.4.1-2. Propagation conditions are set according to Annex C clauses C.2.2. T1 starts.
5. The SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.
6. The UE shall transmit an RRCConnectionReconfigurationComplete message.
7. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.1.4.1-2.
8. UE shall transmit a MeasurementReport message triggered by Event A3 for Cell 3 on PCell (Cell 1). If the overall delays measured from the beginning of time period T2 is less than [922] ms for Test 1 or less than [6402]

ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

9. After the SS receives the MeasurementReport message in step 9 or when T2 expires, the SS shall transmit a RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

10. Set Cell 3 physical cell identity = [((current cell 3 physical cell identity + 1) mod 14 + 2)] for next iteration of the test procedure loop.

11. After the RRC connection release, the SS:
 - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5.
 or
 - if paging fails, switches off and on the UE and ensures the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG according to TS 38.508-1 [14] clause 4.5

12. Repeat steps 3-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.1.2.4.3 Message contents

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

TBD

4.6.1.2.5 Test requirement

Table 4.6.1.2.4.1-2 and Table 4.6.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.1.2.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX

<table>
<tr><th rowspan="2">Parameter</th><th rowspan="2">Unit</th><th rowspan="2">Test configuration</th><th colspan="2">Cell 2</th><th colspan="2">Cell 3</th></tr>
<tr><th>T1</th><th>T2</th><th>T1</th><th>T2</th></tr>
<tr><td rowspan="3">TDD configuration</td><td rowspan="3"></td><td>1</td><td colspan="2">N/A</td><td colspan="2">N/A</td></tr>
<tr><td>2</td><td colspan="2">TDDConf.1.1</td><td colspan="2">TDDConf.1.1</td></tr>
<tr><td>3</td><td colspan="2">TDDConf.2.1</td><td colspan="2">TDDConf.2.1</td></tr>
<tr><td rowspan="3">PDSCH RMC configuration</td><td rowspan="3"></td><td>1</td><td colspan="2">SR.1.1 FDD</td><td colspan="2" rowspan="3">N/A</td></tr>
<tr><td>2</td><td colspan="2">SR.1.1 TDD</td></tr>
<tr><td>3</td><td colspan="2">SR.2.1 TDD</td></tr>
<tr><td rowspan="3">RMSI CORESET RMC configuration</td><td rowspan="3"></td><td>1</td><td colspan="2">CR.1.1 FDD</td><td colspan="2">CR.1.1 FDD</td></tr>
<tr><td>2</td><td colspan="2">CR.1.1 TDD</td><td colspan="2">CR.1.1 TDD</td></tr>
<tr><td>3</td><td colspan="2">CR.2.1 TDD</td><td colspan="2">CR.2.1 TDD</td></tr>
<tr><td rowspan="3">Dedicated CORESET RMC configuration</td><td rowspan="3"></td><td>1</td><td colspan="2">CCR.1.1 FDD</td><td colspan="2">CCR.1.1 FDD</td></tr>
<tr><td>2</td><td colspan="2">CCR.1.1 TDD</td><td colspan="2">CCR.1.1 TDD</td></tr>
<tr><td>3</td><td colspan="2">CCR.2.1 TDD</td><td colspan="2">CCR.2.1 TDD</td></tr>
<tr><td>OCNG Patterns</td><td></td><td>1, 2, 3</td><td colspan="2">OP.1</td><td colspan="2">OP.1</td></tr>
<tr><td>Intial BWP configuration</td><td></td><td>1, 2, 3</td><td colspan="2">DLBWP.0
ULBWP.0</td><td colspan="2">DLBWP.0
ULBWP.0</td></tr>
<tr><td>Active DL BWP configuration</td><td></td><td>1, 2, 3</td><td colspan="2">DLBWP.1</td><td colspan="2">DLBWP.1</td></tr>
<tr><td>Active UL BWP configuration</td><td></td><td>1, 2, 3</td><td colspan="2">ULBWP.1</td><td colspan="2">ULBWP.1</td></tr>
<tr><td>RLM-RS</td><td></td><td>1, 2, 3</td><td colspan="2">SSB</td><td colspan="2">SSB</td></tr>
<tr><td rowspan="3">N_{oc} note 2</td><td rowspan="3">dBm/SCS</td><td>1</td><td colspan="4">-98</td></tr>
<tr><td>2</td><td colspan="4">-98</td></tr>
<tr><td>3</td><td colspan="4">-95</td></tr>
<tr><td rowspan="3">N_{oc} note 2</td><td rowspan="3">dBm/15 KHz</td><td>1</td><td colspan="4" rowspan="3">-98</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td></tr>
<tr><td rowspan="3">$\hat{E}_s/I_{ot}$</td><td rowspan="3">dB</td><td>1</td><td rowspan="3">4</td><td rowspan="3">-1.46</td><td rowspan="3">-Infinity</td><td rowspan="3">-1.46</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td></tr>
<tr><td rowspan="3">$\hat{E}_s/N_{oc}$</td><td rowspan="3">dB</td><td>1</td><td rowspan="3">4</td><td rowspan="3">4</td><td rowspan="3">-Infinity</td><td rowspan="3">4</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td></tr>
<tr><td rowspan="3">SS-RSRP note 3</td><td rowspan="3">dBm/SCS KHz</td><td>1</td><td>-94</td><td>-94</td><td>-Infinity</td><td>-94</td></tr>
<tr><td>2</td><td>-94</td><td>-94</td><td>-Infinity</td><td>-94</td></tr>
<tr><td>3</td><td>-91</td><td>-91</td><td>-Infinity</td><td>-91</td></tr>
<tr><td rowspan="3">Io</td><td>dBm/9.36 MHz</td><td>1</td><td>-64.60</td><td>-62.25</td><td>-Infinity</td><td>-62.25</td></tr>
<tr><td>dBm/9.36 MHz</td><td>2</td><td>-64.60</td><td>-62.25</td><td>-Infinity</td><td>-62.25</td></tr>
<tr><td>dBm/38.16 MHz</td><td>3</td><td>-58.50</td><td>-56.16</td><td>-Infinity</td><td>-56.16</td></tr>
<tr><td>Propagation Condition</td><td></td><td>1, 2, 3</td><td colspan="4">AWGN</td></tr>
<tr><td colspan="7">NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</td></tr>
</table>

Table 4.6.1.2.5-2: DRX-Configuration for EN-DC intra-frequency event triggered reporting with gaps for TDD PSCell in FR1

Field	Test1	Test2	Comment
	Value	Value	
onDurationTimer	psf1	psf1	As specified in clause 6.3.2 in TS 38.331 [13]
drx-InactivityTimer	psf1	psf1	
drx-RetransmissionTimer	psf1	psf1	
longDRX-CycleStartOffset	Sf40	Sf640	
shortDRX	disable	disable	

Table 4.6.1.2.5-3: *TimeAlignmentTimer* -Configuration for EN-DC intra-frequency event triggered reporting with gaps for TDD PSCell in FR1

Field	Test1	Test2	Comment
	Value	Value	
TimeAlignmentTimer	sf500	sf500	As specified in clause 6.3.2 in TS 38.331 [13]

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [920] ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [6400] ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.1.3 EN-DC FR1 event-triggered reporting with gap in non-DRX

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- Cell mapping in Annex E is missing.

- RAN4 dependency:

- Brackets in core requirements

4.6.1.3.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within EN-DC intra-frequency NR cell search requirements in TS 38.133 [6] clause 9.2. This test will partly verify the TDD intra-frequency cell search requirements.

4.6.1.3.2 Test applicability

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

4.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.3.

4.6.1.3.4 Test description

4.6.1.3.4.1 Initial conditions

Test 4.6.1.3 can be run in one of the configurations defined in Table 4.6.1.3.4.1-1.

Table 4.6.1.3.4.1-1: Supported test configurations for NR FR1 Cell

Configuration	Description
4.6.1.3-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.1.3-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.1.3-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.5.4.1-2.

Table 4.6.1.3.4.1-2: Initial conditions for EN-DC event-triggered reporting in FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] sclause 4.4.2 and 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.1.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.6.1.3.4.3.

2. The general test parameter settings are set up according to Table 4.6.1.3.4.1-3.

3. There is one E-UTRA FDD carrier and one E-UTRA PCell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. There is one NR FDD carrier and 2 NR Cells specified in the test. Cell 2 is the PSCell and Cell 3 is the neighbour cell. Cell 2 is configured according to Annex C.1.1 and C.1.2. Cell 3 is powered OFF.

Table 4.6.1.3.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1

Parameter	Unit	Test configuration	Value	Comment
Active cell		1, 2, 3	E-UTRAN Cell 1 and NR Cell 2	
Neighbour cell		1, 2, 3	NR Cell 3	Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 2: Cell 2 and Cell 3	
Measurement gap type		1, 2, 3	Per-UE gaps	
Measurement gap repitition periodicity	ms	1, 2, 3	40	
Measurement gap length	ms	1, 2, 3	6	
Measurement gap offset	ms	1, 2, 3	39	
SSB configuration		1	SSB.1 FR1	
		2	SSB.1 FR1	
		3	SSB.2 FR1	
SMTC configuration		1	SMTC.2	
		2	SMTC.1	
		3	SMTC.1	
CSI-RS parameters		1	CSI-RS.1.2 FDD	
		2	CSI-RS.1.2 TDD	
		3	CSI-RS.2.2 TDD	
A3-Offset	dB	1, 2, 3	-4.5	
CP length		1, 2, 3	Normal	
Hysteresis	dB	1, 2, 3	0	
Time To Trigger	s	1, 2, 3	0	
Filter coefficient		1, 2, 3	0	L3 filtering is not used
DRX		1, 2, 3	N/A	OFF
Time offset between PCell and PSCell		1, 2, 3	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 μs	Synchronous cells
		3	3 μs	Synchronous cells
T1	s	1, 2, 3	5	
T2	s	1, 2, 3	5	

4.6.1.3.4.2 Test procedure

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

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

2. Set the parameters of NR cells according to T1 in Table 4.6.1.3.5-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

3. SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.3.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message embedded in E-UTRA RRC message *ULInformationTransferMRDC* triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than [802] ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6) or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 4.6.1.3.4.3-1: Common Exception messages

Default Message Contents			
	Test configuration 1	**Test configuration 2**	**Test configuration 3**
Common contents of system information blocks exceptions			
Default RRC messages and information elements contents exceptions	FFS	FFS	FFS

4.6.1.3.5 Test requirement

Tables 4.6.1.3.4.1-3 and 4.6.1.3.5-1 define the primary level settings including test tolerances for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1.

Table 4.6.1.3.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
TDD configuration		1	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns		1, 2, 3	OP.1		OP.1	
Intial BWP configuration		1, 2, 3	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2, 3	DLBWP.1.2		DLBWP.1.1	
Active UL BWP configuration		1, 2, 3	ULBWP.1.2		ULBWP.1.1	
RLM-RS		1, 2, 3	CSI-RS		SSB	
N_{oc} Note 2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} Note 2	dBm/15 KHz	1	-98			
		2				
		3				
$\hat{E}_s/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
		2				
		3				
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/9.36 MHz	1	-64.60	-62.25	-Infinity	-62.25
	dBm/9.36 MHz	2	-64.60	-62.25	-Infinity	-62.25
	dBm/38.16 MHz	3	-58.50	-56.16	-Infinity	-56.16
Propagation Condition		1, 2, 3	AWGN			
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to Cell 1.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify\_intra\_with\_index}$

where,

$T_{identify\_intra\_with\_index} = (T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra})$ ms

- T_{PSS/SSS_sync_ntra} = max[600ms, [5] x max(MGRP, SMTC period)] x $CSSF_{intra}$ = max[600ms, [5] x max(40ms, 20ms)] x 1 = 600ms

- $T_{SSB\_measurement\_period\_intra}$ = max[200ms, 5 x max(MGRP, SMTC period)] x $CSSF_{intra}$ = max[200ms, 5 x max(40ms, 20ms)] x 1 = 200ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of [802] ms in this test case (note: this gives a total of 800 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

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

4.6.1.4 EN-DC FR1 event-triggered reporting with gap in DRX

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- Cell mapping in Annex E is missing.

- RAN4 dependency:

- Brackets in core requirements

4.6.1.4.1 Test purpose

To verify that the UE makes correct reporting of an event in DRX within EN-DC intra-frequency NR cell search requirements in TS 38.133 [6] clause 9.2. This test will partly verify the intra-frequency cell search requirements.

4.6.1.4.2 Test applicability

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

4.6.1.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.4.

4.6.1.4.4 Test description

4.6.1.4.4.1 Initial conditions

Test 4.6.1.4 can be run in one of the configurations defined in Table 4.6.1.4.4.1-1.

Table 4.6.1.4.4.1-1: Supported test configurations for NR FR1 Cell

Configuration	Description

4.6.1.4-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.1.4-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.1.4-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.4.4.1-2.

Table 4.6.1.5.4.1-2: Initial conditions for EN-DC event-triggered reporting in FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] sclause 4.4.2 and 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.1.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.6.1.4.4.3.

2. The general test parameter settings are set up according to Table 4.6.1.4.4.1-3.

3. There is one E-UTRA carrier and one E-UTRA PCell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. There is one NR carrier and 2 NR Cells specified in the test. Cell 2 is the PSCell and Cell 3 is the neighbour cell. Cell 2 is configured according to Annex C.1.1 and C.1.2. Cell 3 is powered OFF.

Table 4.6.1.4.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1 with DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
Active cell		1, 2, 3	E-UTRAN Cell 1 and NR Cell 2		
Neighbour cell		1, 2, 3	NR Cell 3		Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 2: Cell 2 and Cell 3		
Measurement gap type		1, 2, 3	Per-UE gaps		
Measurement gap repitition periodicity	ms	1, 2, 3	40		
Measurement gap length	ms	1, 2, 3	6		
Measurement gap offset	ms	1, 2, 3	39		
SSB configuration		1	SSB.1 FR1		
		2	SSB.1 FR1		
		3	SSB.2 FR1		
SMTC configuration		1	SMTC.2		
		2	SMTC.1		
		3	SMTC.1		
CSI-RS parameters		1	CSI-RS.1.2 FDD		
		2	CSI-RS.1.2 TDD		
		3	CSI-RS.2.2 TDD		
A3-Offset	dB	1, 2, 3	-4.5		
CP length		1, 2, 3	Normal		
Hysteresis	dB	1, 2, 3	0		
Time To Trigger	s	1, 2, 3	0		
Filter coefficient		1, 2, 3	0		L3 filtering is not used
DRX		1, 2, 3	DRX.1	DRX.2	
Time offset between PCell and PSCell		1, 2, 3	3 μs		Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 μs		Synchronous cells
		3	3 μs		Synchronous cells
T1	s	1, 2, 3	5		
T2	s	1, 2, 3	5	10	

4.6.1.4.4.2 Test procedure

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

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

2. Set the parameters of NR cells according to T1 in Table 4.6.1.4.5-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

3. SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.4.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message embedded in E-UTRA RRC message *ULInformationTransferMRDC* triggered by Event A3. If the overall delays measured from the beginning of time

period T2 is less than [922] ms for Test 1 or less than [6402] ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6) or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 4.6.1.4.4.3-1: Common Exception messages

Default Message Contents			
	Test configuration 1	**Test configuration 2**	**Test configuration 3**
Common contents of system information blocks exceptions			
Default RRC messages and information elements contents exceptions	FFS	FFS	FFS

4.6.1.4.5 Test requirement

Tables 4.6.1.4.4.1-3 and 4.6.1.4.5-1 define the primary level settings including test tolerances for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1.

Table 4.6.1.4.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1 with DRX

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
TDD configuration		1	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns		1, 2, 3	OP.1		OP.1	
Intial BWP configuration		1, 2, 3	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2, 3	DLBWP.1.2		DLBWP.1.1	
Active UL BWP configuration		1, 2, 3	ULBWP.1.2		ULBWP.1.1	
RLM-RS		1, 2, 3	CSI-RS		SSB	
N_{oc} Note 2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} Note 2	dBm/15 KHz	1	-98			
		2				
		3				
$\hat{E}_s/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
		2				
		3				
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/9.36 MHz	1	-64.60	-62.25	-Infinity	-62.25
	dBm/9.36 MHz	2	-64.60	-62.25	-Infinity	-62.25
	dBm/38.16 MHz	3	-58.50	-56.16	-Infinity	-56.16
Propagation Condition		1, 2, 3	AWGN			
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to Cell 1.

The overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify\_intra\_with\_index}$

where,

For Test 1:

$T_{identify\_intra\_with\_index} = (T_{PSS/SSS\_sync\_ntra} + T_{SSB\_measurement\_period\_intra})$ ms

- T_{PSS/SSS_sync_ntra} = max[600ms, ceil(1.5 x [5]) x max(MGRP, SMTC period, DRX cycle)] x $CSSF_{intra}$ = max[600ms, ceil(1.5 x [5]) x max(40ms, 20ms, 40ms)] x 1 = 600ms
- $T_{SSB\_measurement\_period\_intra}$ = max[200ms, ceil(1.5 x 5) x max(MGRP, SMTC period, DRX cycle)] x $CSSF_{intra}$ = max[200ms, ceil(1.5 x 3) x max(40ms, 20ms, 40ms)] x 1 = 320ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of [922] ms in this test case (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For Test 2:

$T_{identify\_intra\_with\_index} = (T_{PSS/SSS\_sync\_ntra} + T_{SSB\_measurement\_period\_intra})$ ms

- T_{PSS/SSS_sync_ntra} = 5 x max(MGRP, DRX cycle) = 5 x max(40ms, 640ms)] x 1 = 3200ms
- $T_{SSB\_measurement\_period\_intra}$ = 5 x max(MGRP, DRX cycle) x $CSSF_{intra}$ = 5 x max(40ms, 640ms) x 1 = 3200ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of [6402] ms in this test case (note: this gives a total of 6400 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

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

4.6.1.5 EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- Cell mapping in Annex E is missing.

- RAN4 dependency:

Brackets in core requirements

4.6.1.5.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within EN-DC intra-frequency NR cell search requirements in TS 38.133 [6] clause 9.5. This test will partly verify the FDD intra-frequency cell search requirements. UE is required to report SSB time index.

4.6.1.5.2 Test applicability

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

4.6.1.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.x.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.5.

4.6.1.5.4 Test description

4.6.1.5.4.1 Initial conditions

Test 4.6.1.5 can be run in one of the configurations defined in Table 4.6.1.5.4.1-1.

Table 4.6.1.5.4.1-1: Supported test configurations for FR1 PSCell

Configuration	Description
4.6.1.5-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.5.4.1-2.

Table 4.6.1.5.4.1-2: Initial conditions for EN-DC event-triggered reporting in FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] sclause 4.4.2 and 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.1.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.6.1.5.4.3.
2. The general test parameter settings are set up according to Table 4.6.1.5.4.1-3.
3. There is one E-UTRA FDD carrier and one E-UTRA PCell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. There is one NR FDD carrier and 2 NR Cells specified in the test. Cell 2 is the PSCell and Cell 3 is the neighbour cell. Cell 2 is configured according to Annex C.1.1 and C.1.2. Cell 3 is powered OFF.

Table 4.6.1.5.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting without gap for FDD PSCell in FR1 with SSB index reading

Parameter	Unit	Test configuration	Value	Comment
Active cell		1	E-UTRAN Cell 1 and NR Cell 2	
Neighbour cell		1	NR Cell 3	Cell to be identified.
RF Channel Number		1	1: Cell 1 2: Cell 2 and Cell 3	
SSB configuration		1	SSB.1 FR1	
SMTC configuration		1	SMTC.2	
A3-Offset	dB	1	-4.5	
CP length		1	Normal	
Hysteresis	dB	1	0	
Time To Trigger	s	1	0	
Filter coefficient		1	0	L3 filtering is not used
DRX		1	N/A	OFF
Time offset between PCell and PSCell		1	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
T1	s	1	5	
T2	s	1	5	

4.6.1.5.4.2 Test procedure

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

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

2. Set the parameters of NR cells according to T1 in Table 4.6.1.5.5-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

3. SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.5.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message embedded in E-UTRA RRC message *ULInformationTransferMRDC* triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than [922] ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6) or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),

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

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 4.6.1.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

4.6.1.5.5 Test requirement

Tables 4.6.1.5.4.1-3 and 4.6.1.5.5-1 define the primary level settings including test tolerances for EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection.

Table 4.6.1.5.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for FDD PSCell in FR1 with SSB index reading

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
TDD configuration		1	N/A		N/A	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
OCNG Patterns		1	OP.1		OP.1	
Intial BWP configuration		1	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1	SSB		SSB	
N_{oc} Note 2	dBm/SCS	1	-98			
N_{oc} Note 2	dBm/15 KHz	1	-98			
$\hat{E}_s/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
Io	dBm/9.36 MHz	1	-64.60	-62.25	-Infinity	-62.25
Propagation Condition		1	AWGN			
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to Cell 1.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify\_intra\_with\_index}$

where,

$T_{identify\_intra\_with\_index} = (T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra} + T_{SSB\_time\_index\_intra})$ ms

- T_{PSS/SSS_sync_intra} = max[600ms, ceil([5] x K_p) x SMTC period]$^{Note\ 1}$ x $CSSF_{intra}$ = max[600ms, Ceil(5 x 1) x 20ms] x 1 = 600ms

- $T_{SSB\_measurement\_period\_intra}$ = max[200ms, ceil(5 x K_p) x SMTC period]$^{Note\ 1}$ x $CSSF_{intra}$ = max[200ms, ceil(5 x 1) x 20ms] x 1 = 200ms

- $T_{SSB\_time\_index\_intra}$ = max[120ms, ceil(3 x K_p) x SMTC period]$^{Note\ 1}$ x $CSSF_{intra}$ = max[120ms, ceil(3 x 1) x 20ms] x 1 = 120ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of [922] ms in this test case (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

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

4.6.1.6 EN-DC FR1 event-triggered reporting with gap in non-DRX with SSB time index detection

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- Cell mapping in Annex E is missing.

- RAN4 dependency:

- Brackets in core requirements

4.6.1.6.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within EN-DC intra-frequency NR cell search requirements in TS 38.133 [6] clause 9.2. This test will partly verify the FDD intra-frequency cell search requirements. UE is required to report SSB time index.

4.6.1.6.2 Test applicability

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

4.6.1.6.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.6.

4.6.1.6.4 Test description

4.6.1.6.4.1 Initial conditions

Test 4.6.1.6 can be run in one of the configurations defined in Table 4.6.1.6.4.1-1.

Table 4.6.1.6.4.1-1: Supported test configurations for NR FR1 Cell

Configuration	Description
4.6.1.6-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.6.4.1-2.

Table 4.6.1.6.4.1-2: Initial conditions for EN-DC event-triggered reporting in FR1

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.4.2 and 4.3.1.	

Channel bandwidth	As specified by the test configuration selected from Table 4.6.1.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.6.1.6.4.3.
2. The general test parameter settings are set up according to Table 4.6.1.6.4.1-3.
3. There is one E-UTRA FDD carrier and one E-UTRA PCell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. There is one NR FDD carrier and 2 NR Cells specified in the test. Cell 2 is the PSCell and Cell 3 is the neighbour cell. Cell 2 is configured according to Annex C.1.1 and C.1.2. Cell 3 is powered OFF.

Table 4.6.1.6.4.1-2: General test parameters for EN-DC intra-frequency event triggered reporting with gap for PSCell in FR1 with SSB index reading

Parameter	Unit	Test configuration	Value	Comment
Active cell		1	E-UTRAN Cell 1 and NR Cell 2	
Neighbour cell		1	NR Cell 3	Cell to be identified.
RF Channel Number		1	1: Cell 1 2: Cell 2 and Cell 3	
Measurement gap type		1	Per-UE gaps	
Measurement gap repitition periodicity	ms	1	40	
Measurement gap length	ms	1	6	
Measurement gap offset	ms	1	39	
SSB configuration		1	SSB.1 FR1	
SMTC configuration		1	SMTC.2	
CSI-RS parameters		1	CSI-RS.1.2 FDD	
A3-Offset	dB	1	-4.5	
CP length		1	Normal	
Hysteresis	dB	1	0	
Time To Trigger	s	1	0	
Filter coefficient		1	0	L3 filtering is not used
DRX		1	N/A	OFF
Time offset between PCell and PSCell		1	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
T1	s	1	5	
T2	s	1	5	

4.6.1.6.4.2 Test procedure

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

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

2. Set the parameters of NR cells according to T1 in Table 4.6.1.6.5-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

3. SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.6.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message embedded in E-UTRA RRC message *ULInformationTransferMRDC* triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than [922] ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6) or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 4.6.1.6.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

4.6.1.6.5 Test requirement

Tables 4.6.1.6.4.1-3 and 4.6.1.6.5-1 define the primary level settings including test tolerances for EN-DC intra-frequency event triggered reporting with gap for PSCell in FR1 with SSB index reading.

Table 4.6.1.6.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with gap for PSCell in FR1 with SSB index reading

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
TDD configuration		1	N/A		N/A	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
OCNG Patterns		1	OP.1		OP.1	
Intial BWP configuration		1	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1	DLBWP.1.2		DLBWP.1.1	
Active UL BWP configuration		1	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1	CSI-RS		SSB	
N_{oc} Note 2	dBm/SCS	1	-98			
N_{oc} Note 2	dBm/15 KHz	1	-98			
$\hat{E}_s/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
Io	dBm/9.36 MHz	1	-64.60	-62.25	-Infinity	-62.25
Propagation Condition		1	AWGN			
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to Cell 1.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify\_intra\_with\_index}$

where,

$T_{identify\_intra\_with\_index} = (T_{PSS/SSS\_sync\_ntra} + T_{SSB\_measurement\_period\_intra} + T_{SSB\_time\_index\_intra})$ ms

- T_{PSS/SSS_sync_ntra} = max[600ms, [5] x max(MGRP, SMTC period)] x $CSSF_{intra}$ = max[600ms, [5] x max(40ms, 20ms)] x 1 = 600ms

- $T_{SSB\_measurement\_period\_intra}$ = max[200ms, 5 x max(MGRP, SMTC period)] x $CSSF_{intra}$ = max[200ms, 5 x max(40ms, 20ms)] x 1 = 200ms

- $T_{SSB\_time\_index\_intra}$ = max[120ms, 3 x max(MGRP, SMTC period)] x $CSSF_{intra}$ = max[120ms, 3 x max(40ms, 20ms)] x 1 = 120ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of [922] ms in this test case (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

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

4.6.2 Inter-frequency measurements

4.6.2.0 Minimum conformance requirements for Inter-frequency measurements

[TS 38.133, clause 9.3.2]

The requirements in Section 9.3 apply, provided:

- The cell being identified or measured is detectable.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in Sections 10.1.4 and 10.1.5 for FR1 and FR2, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in Sections 10.1.9 and 10.1.10 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in Sections 10.1.14 and 10.1.15 for FR1 and FR2, respectively, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to Annex B.2.3 for a corresponding Band.

[TS 38.133, clause 9.3.4]

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter frequency cell within $T_{identify\_inter\_without\_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within $T_{identify\_inter\_with\_index}$. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within $T_{identify\_inter\_without\_index}$.

$$T_{identify\_inter\_without\_index} = (T_{PSS/SSS\_sync\_inter} + T_{SSB\_measurement\_period\_inter})\ ms$$

$$T_{identify\_inter\_with\_index} = (T_{PSS/SSS\_sync\_inter} + T_{SSB\_measurement\_period\_inter} + T_{SSB\_time\_index\_inter})\ ms$$

Where:

T_{PSS/SSS_sync_inter}: it is the time period used in PSS/SSS detection given in table 9.3.4-1.

$T_{SSB\_time\_index\_inter}$: it is the time period used to acquire the index of the SSB being measured given in table 9.3.4-3.

$T_{SSB\_measurement\_period\_inter}$: equal to a measurement period of SSB based measurement given in table 9.3.5-1.

$M_{SSB\_index\_inter}$: For a UE supporting power class 1, $M_{SSB\_index\_inter}$ =[40] samples. For a vehicle mounted UE supporting power class 2 (vehicle mounted), M_{pss/sss_sync_inter}=[24] samples.For a UE supporting power class 3 (handheld), $M_{SSB\_index\_inter}$ =[24] samples. For a UE supporting power class 4, $M_{meas\_period\_inter}$ =[TBD] samples.

$M_{meas\_period\_inter}$: For a UE supporting FR2 power class 1, $M_{meas\_period\_inter}$ =64 samples. For a vehicle mounted UE supporting FR2 power class 2 (vehicle mounted), M_{pss/sss_sync_inter}=40 samples.For a UE supporting FR2 power class 3 (handheld), $M_{meas\_period\_inter}$ =40 samples. For a UE supporting FR2 power class 4, $M_{meas\_period\_inter}$ =[40] samples.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within\_gap,i}$ in section 9.1.5.2 for measurement conducted within measurement gaps.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in Sections 10.1.4 and 10.1.5 for FR1 and FR2, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in Sections 10.1.9 and 10.1.10 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in Sections 10.1.14 and 10.1.15 for FR1 and FR2, respectively, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to Annex B.2.3 for a corresponding Band.

Table 9.3.4-1: Time period for PSS/SSS detection, (Frequency range FR1)

Condition NOTE1,2	T_{PSS/SSS_sync_inter}
No DRX	max[600ms, [8] x max(MGRP, SMTC period)] x $CSSF_{inter}$
DRX cycle ≤ 320ms	max[600ms, ceil(8x1.5) x max(MGRP, SMTC period, DRX cycle)] x $CSSF_{inter}$
DRX cycle > 320ms	[8] x DRX cycle x $CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

Table 9.3.4-3: Time period for time index detection (Frequency range FR1)

Condition NOTE1,2	$T_{SSB\_time\_index\_inter}$
No DRX	max[120ms, [3] x max(MGRP, SMTC period)] x $CSSF_{inter}$
DRX cycle ≤ 320ms	max[120ms, ceil(3 x 1.5) x max(MGRP, SMTC period, DRX cycle)] x $CSSF_{inter}$
DRX cycle > 320ms	[3] x DRX cycle x $CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

[TS 38.133, clause 9.3.5]

When measurement gaps are provided for inter frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in sub-clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 9.3.5-1 and 9.3.5-2:

Table 9.3.5-1: Measurement period for inter-frequency measurements with gaps (Frequency FR1)

Condition NOTE1,2	$T_{SSB\_measurement\_period\_inter}$
No DRX	max[200ms, [8] x max(MGRP, SMTC period)] x $CSSF_{inter}$
DRX cycle ≤ 320ms	max[200ms, ceil(8 x 1.5) x max(MGRP, SMTC period, DRX cycle)] x $CSSF_{inter}$
DRX cycle > 320ms	[8] x DRX cycle x $CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

[TS 38.133, clause 9.3.6.3]

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered measurement reports shall meet the requirements in sections 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be within $T_{identify\_inter\_without\_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index. Otherwise UE shall be able to identify a new detectable inter frequency cell within $T_{identify\_inter\_with\_index}$. Both $T_{identify\_inter\_without\_index}$ and $T_{identify\_inter\_with\_index}$ are defined in clause 9.3.4. When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{identify\_inter\_without\_index}$ or $T_{identify\_inter\_with\_index}$ defined in clause 9.3.4 and then triggers the measurement report as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than $T_{SSB\_measurement\_period\_inter}$ defined in clause 9.3.5 provided the timing to that cell has not changed more than ± 3200 Tc while measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clause 9.3.2, 9.3.4, 9.3.5, 9.3.6.3.

4.6.2.1 EN-DC FR1-FR1 event-triggered reporting in non-DRX

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.
- Antenna diagram for TE Part for 4Rx capable UEs without any 2Rx RF bands is TBD
- Message content is TBD
- Minimum conformance requirements contain [ ] and TBDs (RAN4 Pending)
- Test requirement contains TBDs (RAN4 Pending)
- Initial conditions contain TBDs (RAN4 Pending)
- T1 and T2 are TBD (RAN4 Pending)

4.6.2.1.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within EN-DC inter-frequency NR cell search requirements without SSB time index detection in TS 38.133 [6] clause 9.3.4.

4.6.2.1.2 Test applicability

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

4.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.2.1.

4.6.2.1.4 Test description

4.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.2.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.2.1.4.1-2. Test environment parameters are given in Table 4.6.2.1.4.1-3.

Table 4.6.2.1.4.1-1: EN-DC FR1-FR1 event triggered reporting tests in non-DRX supported test configurations

Test Case ID	Description
4.6.2.1-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.2.1-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.2.1-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.6.2.1-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.2.1-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.2.1-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2	

Table 4.6.2.1.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1		One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3		NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0	4	As specified in TS 38.133 clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39	19	
SMTC-SSB parameters		Config 1,4	SSB.1 FR1		As specified in TS 38.133 clause A.3.10.1
		Config 2,5	SSB.1 FR1		As specified in TS 38.133 clause A.3.10.1
		Config 3,6	SSB.2 FR1		As specified in TS 38.133 clause A.3.10.1
A3-Offset	dB	Config 1,2,3,4,5,6	-6		
Hysteresis	dB	Config 1,2,3,4,5,6	0		
CP length		Config 1,2,3,4,5,6	Normal		
TimeToTrigger	s	Config 1,2,3,4,5,6	0		
Filter coefficient		Config 1,2,3,4,5,6	0		L3 filtering is not used
DRX		Config 1,2,3,4,5,6	OFF		DRX is not used
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 µs		Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3µs		Synchronous cells.
T1	s	Config 1,2,3,4,5,6	5		
T2	s	Config 1,2,3,4,5,6	TBD	TBD	

Table 4.6.2.1.4.1-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.	
Channel bandwidth	As specified by the test configuration selected from Table 4.6.2.1.4.1-1.	

Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.x.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.x	
Exceptions to connection diagram	- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT Part. and TBD for TE Part		

1. Message contents are defined in clause 4.6.2.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex C.1.2.

4.6.2.1.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 4.6.2.1.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table 4.6.2.1.4.1-2 is provided for UE that support per-FR gap. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

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

2. Set the parameters according to T1 in Table 4.6.2.1.4.1-2.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.2.1.4.1-2.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 4.6.2.1.4.1-2 as appropriate.

4.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 4.6.2.1.4.3-1: Common Exception messages for Additional EN-DC FR1-FR1 event triggered reporting tests in non-DRX test requirement

Default Message Contents	
Common contents of system information blocks exceptions	Table H. TBD
Default RRC messages and information elements contents exceptions	Table H. TBD

TBD

4.6.2.1.5 Test requirement

Table 4.6.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.2.1.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Cell 2 T1	Cell 2 T2	Cell 3 T1	Cell 3 T2
NR RF Channel Number		Config 1,2,3,4,5,6	1		2	
Duplex mode		Config 1,4	FDD			
		Config 2,3,5,6	TDD			
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52			
		Config 2,5	10: $N_{RB,c}$ = 52			
		Config 3,6	40: $N_{RB,c}$ = 106			
BWP BW	MHz	Config 1,4	10: $N_{RB,c}$ = 52			
		Config 2,5	10: $N_{RB,c}$ = 52			
		Config 3,6	40: $N_{RB,c}$ = 106			
TDD configuration		Config 2,5	TDDConf.1.1		TDDConf.1.1	
		Config 3,6	TDDConf.2.1		TDDConf.2.1	
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1		NA	
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1		NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2,3,4,5,6	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,4	SR.1.1 FDD		-	
		Config 2,5	SR.1.1 TDD			
		Config 3,6	SR2.1 TDD			
CORESET Reference Channel		Config 1,4	CR.1.1 FDD		-	
		Config 2,5	CR.1.1 TDD			
		Config 3,6	CR2.1 TDD			
SMTC configuration defined in A.3.2.11.1 and A.3.2.11.2		Config 1,4	SMTC.2			
		Config 2,3,5,6	SMTC.1			
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15			
		Config 3,6	30			
EPRE ratio of PSS to SSS		Config 1,2,3,4,5,6	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2	dBm/15 kHz		-98+TT			
N_{oc} Note2	dBm/SCS	Config 1,2,4,5	-98+TT			
		Config 3,6	-95+TT			
SS-RSRP Note 3	dBm/SCS	Config 1,2,4,5	-94+TT	-94+TT	-Infinity	-91+TT
		Config 3,6	-91+TT	-91+TT	-Infinity	-88+TT
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3,4,5,6	4+TT	4+TT	-Infinity	7+TT

$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6	4+TT	4+TT	-Infinity	7+TT
Io[Note3]	dBm/9.36MHz	Config 1,2,4,5	-67.11	-67.11	-Infinity	-65.38
	dBm/38.16MHz	Config 3,6	-62.27	-62.27	-Infinity	-61.06
Propagation Condition		Config 1,2,3,4,5,6	AWGN			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.						

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI$_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.2.2 EN-DC FR1-FR1 event-triggered reporting in DRX

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.
- Antenna diagram for TE Part for 4Rx capable UEs without any 2Rx RF bands is TBD
- Message content is TBD
- Minimum conformance requirements contain [ ] and TBDs (RAN4 Pending)
- Test requirement contains TBDs (RAN4 Pending)
- T1 and T2 are TBD (RAN4 Pending)

4.6.2.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX within EN-DC inter-frequency NR cell search requirements without SSB time index detection in TS 38.133 [6] clause 9.3.4.

4.6.2.2.2 Test applicability

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

4.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.2.2.

4.6.2.2.4 Test description

4.6.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.2.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.2.2.4.1-2. Test environment parameters are given in Table 4.6.2.2.4.1-3.

Table 4.6.2.2.4.1-1: EN-DC FR1-FR1 event triggered reporting tests in DRX supported test configurations

Test Case ID	Description
4.6.2.2-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.2.2-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.2.2-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.6.2.2-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.2.2-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.2.2-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2	

Table 4.6.2.2.4-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1				One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2				Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)				LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3				NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0		4		As specified in TS 38.133 clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39		19		
SMTC-SSB parameters		Config 1,4	SSB.1 FR1				As specified in TS 38.133 clause A.3.10.1
		Config 2,5	SSB.1 FR1				As specified in TS 38.133 clause A.3.10.1
		Config 3,6	SSB.2 FR1				As specified in TS 38.133 clause A.3.10.1
A3-Offset	dB	Config 1,2,3,4,5,6	-6				
Hysteresis	dB	Config 1,2,3,4,5,6	0				
CP length		Config 1,2,3,4,5,6	Normal				
TimeToTrigger	s	Config 1,2,3,4,5,6	0				
Filter coefficient		Config 1,2,3,4,5,6	0				L3 filtering is not used
DRX	ms	Config 1,2,3,4,5,6	DRX.1	DRX.2	DRX.1	DRX.2	DRX is used
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 µs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms				Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3µs				Synchronous cells.
T1	s	Config 1,2,3,4,5,6	5				
T2	s	Config 1,2,3,4,5,6	TBD	TBD	TBD	TBD	

Table 4.6.2.2.4-3: Test Environment parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.	
Channel bandwidth	As specified by the test configuration selected from Table 4.6.2.1.4.1-1.	

Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.x.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.x	
Exceptions to connection diagram	- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT Part. and TBD for TE Part		

1. Message contents are defined in clause 4.6.2.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex C.1.2.

4.6.2.2.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 4.6.2.2.4-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table 4.6.2.2.4-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

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

2. Set the parameters according to T1 in Table 4.6.2.2.4-2.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.2.2.4-2.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than TBD for Test 1, TBD for Test 2, TBD for Test 3 and TBD for Test 4 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters

Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
or:
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 4.6.2.2.4-2 as appropriate.

4.6.2.2.4.3 Message contents

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

TBD

4.6.2.2.5 Test requirement

Table 4.6.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.2.2.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test configuration	Cell 2 T1	Cell 2 T2	Cell 3 T1	Cell 3 T2
NR RF Channel Number		Config 1,2,3,4,5,6	1		2	
Duplex mode		Config 1,4	FDD			
		Config 2,3,5,6	TDD			
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52			
		Config 2,5	10: $N_{RB,c}$ = 52			
		Config 3,6	40: $N_{RB,c}$ = 106			
BWP BW	MHz	Config 1,4	10: $N_{RB,c}$ = 52			
		Config 2,5	10: $N_{RB,c}$ = 52			
		Config 3,6	40: $N_{RB,c}$ = 106			
TDD configuration		Config 2,5	TDDConf.1.1		TDDConf.1.1	
		Config 3,6	TDDConf.2.1		TDDConf.2.1	
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1		NA	
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1		NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2,3,4,5,6	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,4	SR.1.1 FDD		-	
		Config 2,5	SR.1.1 TDD			
		Config 3,6	SR2.1 TDD			
CORESET Reference Channel		Config 1,4	CR.1.1 FDD		-	
		Config 2,5	CR.1.1 TDD			
		Config 3,6	CR2.1 TDD			
SMTC configuration defined in A.3.11.1 and A.3.11.2		Config 1,4	SMTC.2			
		Config 2,3,5,6	SMTC.1			
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15			
		Config 3,6	30			
EPRE ratio of PSS to SSS		Config 1,2,3,4,5,6	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2	dBm/15 kHz		-98			
N_{oc} Note2	dBm/SCS	Config 1,2,4,5	-98			
		Config 3,6	-95			
SS-RSRP Note 3	dBm/SCS	Config 1,2,4,5	-94	-94	-Infinity	-91
		Config 3,6	-91	-91	-Infinity	-88

$\hat{E}_s/I_{ot}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
Io[Note3]	dBm/9. 36MHz	Config 1,2,4,5	-67.11	-67.11	-Infinity	-65.38
	dBm/38 .16MHz	Config 3,6	-62.27	-62.27	-Infinity	-61.06
Propagation Condition		Config 1,2,3,4,5,6	AWGN			

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

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.2.3 EN-DC FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.
- Antenna diagram for TE Part for 4Rx capable UEs without any 2Rx RF bands is TBD
- Message content is TBD
- Minimum conformance requirements contain [ ] and TBDs (RAN4 pending)
- Test procedure contains TBDs (RAN4 pending)
- Test requirement contains TBDs (RAN4 pending)
- Initial conditions contains TBDs (RAN4 pending)

- T1 and T2 are TBD (RAN4 pending)
- Section number will change (RAN4 pending)

4.6.2.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in non-DRX within EN-DC inter-frequency NR cell search requirements with SSB time index detection in TS 38.133 [6] clause 9.3.4.

4.6.2.3.2 Test applicability

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

4.6.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.2.3.

4.6.2.3.4 Test description

4.6.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.2.3.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.2.3.4.1-2. Test environment parameters are given in Table 4.6.2.3.4.1-3.

Table 4.6.2.3.4.1-1: EN-DC FR1-FR1 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations

Test Case ID	Description
4.6.2.3-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.2.3-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.2.3-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.6.2.3-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.2.3-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.2.3-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2	

Table 4.6.2.3.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1		One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3		NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0	4	As specified in TS 38.133 clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39	19	
SMTC-SSB parameters		Config 1,4	SSB.1 FR1		As specified in TS 38.133 clause A.3.10.1
		Config 2,5	SSB.1 FR1		As specified in TS 38.133 clause A.3.10.1
		Config 3,6	SSB.2 FR1		As specified in TS 38.133 clause A.3.10.1
A3-Offset	dB	Config 1,2,3,4,5,6	-6		
Hysteresis	dB	Config 1,2,3,4,5,6	0		
CP length		Config 1,2,3,4,5,6	Normal		
TimeToTrigger	s	Config 1,2,3,4,5,6	0		
Filter coefficient		Config 1,2,3,4,5,6	0		L3 filtering is not used
DRX		Config 1,2,3,4,5,6	OFF		DRX is not used
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 µs		Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3µs		Synchronous cells.
T1	s	Config 1,2,3,4,5,6	5		
T2	s	Config 1,2,3,4,5,6	TBD	TBD	

Table 4.6.2.3.4-3: Test Environment parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in non-DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.	
Channel bandwidth	As specified by the test configuration selected from Table 4.6.2.1.4.1-1.	

Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.x.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.x	
Exceptions to connection diagram	- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT Part. and TBD for TE Part		

1. Message contents are defined in clause 4.6.2.3.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex C.1.2.

4.6.2.3.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCel in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 4.6.2.3.4-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table 4.6.2.3.4-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.2.3.4-2.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.2.3.4-2.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure

parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 4.6.2.3.4-2 as appropriate.

4.6.2.3.4.3 Message contents

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

TBD

4.6.2.3.5 Test requirement

Table 4.6.2.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.2.3.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test configuration	Cell 2 T1	Cell 2 T2	Cell 3 T1	Cell 3 T2
NR RF Channel Number		Config 1,2,3,4,5,6	1		2	
Duplex mode		Config 1,4	FDD			
		Config 2,3,5,6	TDD			
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52			
		Config 2,5	10: $N_{RB,c}$ = 52			
		Config 3,6	40: $N_{RB,c}$ = 106			
BWP BW	MHz	Config 1,4	10: $N_{RB,c}$ = 52			
		Config 2,5	10: $N_{RB,c}$ = 52			
		Config 3,6	40: $N_{RB,c}$ = 106			
TDD configuration		Config 2,5	TDDConf.1.1		TDDConf.1.1	
		Config 3,6	TDDConf.2.1		TDDConf.2.1	
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1		NA	
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1		NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2,3,4,5,6	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,4	SR.1.1 FDD		-	
		Config 2,5	SR.1.1 TDD			
		Config 3,6	SR2.1 TDD			
CORESET Reference Channel		Config 1,4	CR.1.1 FDD		-	
		Config 2,5	CR.1.1 TDD			
		Config 3,6	CR2.1 TDD			
SMTC configuration defined in A.3.2.11.1 and A.3.2.11.2		Config 1,4	SMTC.2			
		Config 2,3,5,6	SMTC.1			
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15			
		Config 3,6	30			
EPRE ratio of PSS to SSS		Config 1,2,3,4,5,6	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2	dBm/15 kHz		-98			
N_{oc} Note2	dBm/SCS	Config 1,2,4,5	-98			
		Config 3,6	-95			
SS-RSRP Note 3	dBm/SCS	Config 1,2,4,5	-94	-94	-Infinity	-91
		Config 3,6	-91	-91	-Infinity	-88

$\hat{E}_s/I_{ot}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
Io[Note3]	dBm/9.36MHz	Config 1,2,4,5	-67.11	-67.11	-Infinity	-65.38
	dBm/38.16MHz	Config 3,6	-62.27	-62.27	-Infinity	-61.06
Propagation Condition		Config 1,2,3,4,5,6	AWGN			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.						

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.2.4 EN-DC FR1-FR1 event-triggered reporting in DRX with SSB time index detection

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.
- Antenna diagram for TE Part for 4Rx capable UEs without any 2Rx RF bands is TBD
- Message content is TBD
- Minimum conformance requirements contain [ ] and TBDs (RAN4 pending)
- Test procedure contains TBDs (RAN4 pending)
- Test requirement contains TBDs (RAN4 pending)
- Initial conditions contain TBDs (RAN4 pending)
- T1 and T2 are TBD (RAN4 pending)
- Section number will change (RAN4 pending)

4.6.2.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX within EN-DC inter-frequency NR cell search requirements with SSB time index detection in TS 38.133 [6] clause 9.3.4.

4.6.2.4.2 Test applicability

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

4.6.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.2.4.

4.6.2.4.4 Test description

4.6.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.2.4.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.2.4.4.1-2. Test environment parameters are given in Table 4.6.2.4.4.1-3.

Table 4.6.2.4.4.1-1: EN-DC FR1-FR1 event triggered reporting tests in DRX with SSB time index detection supported test configurations

Test Case ID	Description
4.6.2.4-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.2.4-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.2.4-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.6.2.4-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.2.4-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.2.4-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2	

Table 4.6.2.4.4-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1				One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2				Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)				LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3				NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0		4		As specified in TS 38.133 clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39		19		
SMTC-SSB parameters		Config 1,4	SSB.1 FR1				As specified in TS 38.133 clause A.3.10.1
		Config 2,5	SSB.1 FR1				As specified in TS 38.133 clause A.3.10.1
		Config 3,6	SSB.2 FR1				As specified in TS 38.133 clause A.3.10.1
A3-Offset	dB	Config 1,2,3,4,5,6	-6				
Hysteresis	dB	Config 1,2,3,4,5,6	0				
CP length		Config 1,2,3,4,5,6	Normal				
TimeToTrigger	s	Config 1,2,3,4,5,6	0				
Filter coefficient		Config 1,2,3,4,5,6	0				L3 filtering is not used
DRX	ms	Config 1,2,3,4,5,6	DRX.1	DRX.2	DRX.1	DRX.2	DRX is used
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 µs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms				Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3µs				Synchronous cells.
T1	s	Config 1,2,3,4,5,6	5				
T2	s	Config 1,2,3,4,5,6	TBD	TBD	TBD	TBD	

Table 4.6.2.4.4-3: Test Environment parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.	
Channel bandwidth	As specified by the test configuration selected from Table 4.6.2.1.4.1-1.	

Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.x.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.x	
Exceptions to connection diagram	- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT Part. and TBD for TE Part		

1. Message contents are defined in clause 4.6.2.4.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex C.1.2.

4.6.2.4.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 4.6.2.4.4-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table 4.6.2.4.4-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.2.4.4-2.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.2.4.4-2.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than TBD for Test 1, TBD for Test 2, TBD for Test 3 and TBD for Test 4 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off

and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
or:
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 4.6.2.4.4-2 as appropriate.

4.6.2.4.4.3 Message contents

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

TBD

4.6.2.4.5 Test requirement

Table 4.6.2.5.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.2.4.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
NR RF Channel Number		Config 1,2,3,4,5,6	1		2	
Duplex mode		Config 1,4	FDD			
		Config 2,3,5,6	TDD			
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52			
		Config 2,5	10: $N_{RB,c}$ = 52			
		Config 3,6	40: $N_{RB,c}$ = 106			
BWP BW	MHz	Config 1,4	10: $N_{RB,c}$ = 52			
		Config 2,5	10: $N_{RB,c}$ = 52			
		Config 3,6	40: $N_{RB,c}$ = 106			
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2,3,4,5,6	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,4	SR.1.1 FDD		-	
		Config 2,5	SR.1.1 TDD			
		Config 3,6	SR2.1 TDD			
CORESET Reference Channel		Config 1,4	CR.1.1 FDD		-	
		Config 2,5	CR.1.1 TDD			
		Config 3,6	CR2.1 TDD			
TDD configuration		Config 2,5	TDDConf.1.1			
		Config 3,6	TDDConf.2.1			
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1			
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1			
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1			
SMTC configuration defined in A.3.11.1 and A.3.11.2		Config 1,4	SMTC.2			
		Config 2,3,5,6	SMTC.1			
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15			
		Config 3,6	30			
EPRE ratio of PSS to SSS		Config 1,2,3,4,5,6	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2	dBm/15 kHz		-98			
N_{oc} Note2	dBm/SCS	Config 1,2,4,5	-98			
		Config 3,6	-95			
SS-RSRP Note 3	dBm/SCS	Config 1,2,4,5	-94	-94	-Infinity	-91
		Config 3,6	-91	-91	-Infinity	-88

$\hat{E}_s/I_{ot}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
Io[Note3]	dBm/9.36MHz	Config 1,2,4,5	-67.11	-67.11	-Infinity	-65.38
	dBm/38.16MHz	Config 3,6	-62.27	-62.27	-Infinity	-61.06
Propagation Condition		Config 1,2,3,4,5,6	AWGN			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.						

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2 , 3 and 4 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.7 Measurement performance requirements

4.7.1 SS-RSRP

4.7.1.0 Minimum conformance requirements

4.7.1.0.1 Intra-frequency absolute SS-RSRP measurement accuracy requirements

The intra-frequency SS-RSRP absolute accuracy requirements are defined for the SS-RSRP measured from a cell on the same frequency as that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.1.0.1-1 are valid under the following conditions:

- Conditions defined in 38.101-1 [2] Clause 7.3 for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB,
- Other conditions are [TBD].

Table 4.7.1.0.1-1: SS-RSRP intra frequency absolute accuracy in FR1

Accuracy		Conditions					
			Io Note 1 range				
Normal condition	Extreme condition	SSB Ês/Iot	NR operating band groups Note 2	Minimum Io			Maximum Io
				dBm / SCS_{SSB}			
dB	dB	dB		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	$dBm/BW_{Channel}$	$dBm/BW_{Channel}$
±4.5	±9	≥-6	NR_FDD_FR1_A, NR_TDD_FR1_A	-121	-118	N/A	-70
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-70
			NR_TDD_FR1_C	-120	-117	N/A	-70
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-70
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-70
			NR_FDD_FR1_G	-118	-115	N/A	-70
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-70
±8	±11	≥-6	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_G, NR_FDD_FR1_H,	N/A	N/A	-70	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR operating band groups in FR1 are as defined in Section 3A.4.1							

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

Table 4.7.1.0.1-2: SS-RSRP and CSI-RSRP measurement report mapping

Reported value	Measured quantity value(L3 SS-RSRP)	Measured quantity value(L1 SS-RSRP and CSI-RSRP)	Unit
RSRP_0	SS-RSRP<-156	Not valid	dBm
RSRP_1	-156≤ SS-RSRP<-155	Not valid	dBm
RSRP_2	-155≤ SS-RSRP<-154	Not valid	dBm
RSRP_3	-154≤ SS-RSRP<-153	Not valid	dBm
RSRP_4	-153≤ SS-RSRP<-152	Not valid	dBm
RSRP_5	-152≤ SS-RSRP<-151	Not valid	dBm
RSRP_6	-151≤ SS-RSRP<-150	Not valid	dBm
RSRP_7	-150≤ SS-RSRP<-149	Not valid	dBm

RSRP_8	-149≤ SS-RSRP<-148	Not valid	dBm
RSRP_9	-148≤ SS-RSRP<-147	Not valid	dBm
RSRP_10	-147≤ SS-RSRP<-146	Not valid	dBm
RSRP_11	-146≤ SS-RSRP<-145	Not valid	dBm
RSRP_12	-145≤ SS-RSRP<-144	Not valid	dBm
RSRP_13	-144≤ SS-RSRP<-143	Not valid	dBm
RSRP_14	-143≤ SS-RSRP<-142	Not valid	dBm
RSRP_15	-142≤ SS-RSRP<-141	Not valid	dBm
RSRP_16	-141≤ SS-RSRP<-140	RSRP<-140	dBm
RSRP_17	-140≤ SS-RSRP<-139	-140≤ RSRP<-139	dBm
RSRP_18	-139≤ SS-RSRP<-138	-139≤ RSRP<-138	dBm
…	…		…
RSRP_111	-46≤ SS-RSRP<-45	-46≤ RSRP<-45	dBm
RSRP_112	-45≤ SS-RSRP<-44	-45≤ RSRP<-44	dBm
RSRP_113	-44≤ SS-RSRP<-43	-44≤ RSRP	dBm
RSRP_114	-43≤ SS-RSRP<-42	Not valid	dBm
RSRP_115	-42≤ SS-RSRP<-41	Not valid	dBm
RSRP_116	-41≤ SS-RSRP<-40	Not valid	dBm
RSRP_117	-40≤ SS-RSRP<-39	Not valid	dBm
RSRP_118	-39≤ SS-RSRP<-38	Not valid	dBm
RSRP_119	-38≤ SS-RSRP<-37	Not valid	dBm
RSRP_120	-37≤ SS-RSRP<-36	Not valid	dBm
RSRP_121	-36≤ SS-RSRP<-35	Not valid	dBm
RSRP_122	-35≤ SS-RSRP<-34	Not valid	dBm
RSRP_123	-34≤ SS-RSRP<-33	Not valid	dBm
RSRP_124	-33≤ SS-RSRP<-32	Not valid	dBm
RSRP_125	-32≤ SS-RSRP<-31	Not valid	dBm
RSRP_126	-31≤ SS-RSRP	Not valid	dBm
RSRP_127[1]	Infinity	Infinity	dBm
Note 1: The value of RSRP_127 is applicable for RSRP threshold configured by the network as defined in TS 38.331 [13], but not for the purpose of measurement reporting.			

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.2.1.1 and 10.1.6.

4.7.1.0.2 Intra-frequency relative SS-RSRP measurement accuracy requirements

The intra-frequency relative accuracy of SS-RSRP is defined as the SS-RSRP measured from one cell compared to the SS-RSRP measured from another cell on the same frequency in FR1.

The accuracy requirements in Table 4.7.1.0.2-1 are valid under the following conditions:

- Conditions defined in 38.101-1 [2] Clause 7.3 for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB,
- Other conditions are [TBD].

Table 4.7.1.0.2-1: SS-RSRP Intra frequency relative accuracy in FR1

Accuracy		Conditions					
Normal condition	Extreme condition	SSB Ês/Iot Note 2	Io Note 1 range				
			NR operating band groups Note 4	Minimum Io			Maximum Io
				dBm / SCS_{SSB}		dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
dB	dB	dB		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz		
±2	±3	≥-3	NR_FDD_FR1_A, NR_TDD_FR1_A	-121	-118	N/A	-50
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50
			NR_TDD_FR1_C	-120	-117	N/A	-50
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50
			NR_FDD_FR1_G	-118	-115	N/A	-50
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50
±3	±3	≥-6	Note 3	Note 3	Note 3	N/A	Note 3
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies. NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement. NOTE 4: NR operating band groups in FR1 are as defined in TS 38.133 [6] Section 3.5.2.							

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.2.1.2 and 10.1.6.

4.7.1.0.3 Inter-frequency absolute SS-RSRP measurement accuracy requirements

The inter-frequency SS-RSRP absolute accuracy requirements in this clause are defined for the SS-RSRP measured from a cell on a different frequency as that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.1.0.3-1 are valid under the following conditions:

- Conditions defined in 38.101-1 [2] Clause 7.3 for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB,
- Other conditions are [TBD].

Table 4.7.1.0.3-1: SS-RSRP inter frequency absolute accuracy in FR1

Accuracy		Conditions					
Normal condition	Extreme condition	SSB Ês/Iot Note 2	Io Note 1 range				
			NR operating band groups Note 3	Minimum Io			Maximum Io
				dBm / SCS_{SSB}			
dB	dB	dB		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
±4.5	±6	≥[-46]	NR_FDD_FR1_A, NR_TDD_FR1_A	-121	-118	N/A	-70
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-70
			NR_TDD_FR1_C	-120	-117	N/A	-70
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-70
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-70
			NR_FDD_FR1_G	-118	-115	N/A	-70
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-70
±8	±11	≥[-46]	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_G, NR_FDD_FR1_H,	N/A	N/A	-70	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies. NOTE 3: NR operating band groups in FR1 are as defined in Section 3A.4.1							

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.4.1.1 and 10.1.6.

4.7.1.0.4 Inter-frequency relative SS-RSRP measurement accuracy requirements

The inter-frequency SS-RSRP relative accuracy requirements in this clause are defined for the SS-RSRP measured from a cell on a different frequency as that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.1.0.4-1 are valid under the following conditions:

- Conditions defined in 38.101-1 [2] Clause 7.3 for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB,
- $\left| RSRP1|_{dBm} - RSRP2|_{dBm} \right| \le 27dB$
- | Channel 1_Io -Channel 2_Io | ≤ 20 dB
- Other conditions are [TBD].

Table 4.7.1.0.4-1: SS-RSRP inter frequency relative accuracy in FR1

Accuracy		Conditions					
Normal condition	Extreme condition	SSB Ês/Iot Note 2	Io Note 1 range				
			NR operating band groups Note 3	Minimum Io			Maximum Io
				dBm / SCS_{SSB}		dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
dB	dB	dB		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz		
±4.5	±6	≥[-46]	NR_FDD_FR1_A, NR_TDD_FR1_A	-121	-118	N/A	-50
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50
			NR_TDD_FR1_C	-120	-117	N/A	-50
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50
			NR_FDD_FR1_G	-118	-115	N/A	-50
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.
NOTE 3: NR operating band groups in FR1 are as defined in Section 3A.4.1

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.4.1.2 and 10.1.6.

4.7.1.1 Intra-frequency measurements

4.7.1.1.1 EN-DC FR1 SS-RSRP absolute measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

4.7.1.1.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

4.7.1.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.1.1.

4.7.1.1.1.4 Test description

4.7.1.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.1.1.1.4.1-1.

Table 4.7.1.1.1.4.1-1: EN-DC FR1 SS-RSRP measurement accuracy supported test configurations

Test Case ID	Description
4.7.1.1.1-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.1.1.1-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.1.1.1-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.1.1.1-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.1.1.1-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.1.1.1-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 4.7.1.1.1.4.1-2.

Table 4.7.1.1.1.4.1-2: Initial conditions for SS-RSRP intra frequency absolute accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.1.1.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1.

4.7.1.1.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On,* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4.7.1.1.1.5-1 as appropriate.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport. The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in Table 4.7.1.1.1.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Repeat steps 1-7 for each sub-test in Table 4.7.1.1.1.5-1 as appropriate.

4.7.1.1.1.4.3 Message contents

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

TBD

4.7.1.1.1.5 Test requirement

Table 4.7.1.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 4.7.1.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.1.1.1.5-2.

Table 4.7.1.1.1.5-1: EN-DC FR1 SS-RSRP measurement accuracy test parameters

Parameter		Unit	Test 1		Test 2		Test 3	
			Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN			freq1		freq1		freq1	
Duplex mode	Config 1,4		FDD					
	Config 2,3,5,6		TDD					
TDD configuration	Config 1,4		Not Applicable					
	Config 2,5		TDDConf.1.1					
	Config 3,6		TDDConf.2.1					
$BW_{channel}$	Config 1,4	MHz	10: $N_{RB,c}$ = 52					
	Config 2,5		10: $N_{RB,c}$ = 52					
	Config 3,6		40: $N_{RB,c}$ = 106					
BWP BW	Config 1,4		10: $N_{RB,c}$ = 52					
	Config 2,5		10: $N_{RB,c}$ = 52					
	Config 3,6		40: $N_{RB,c}$ = 106					
Downlink initial BWP configuration			DLBWP.0					
Downlink dedicated BWP configuration			DLBWP.1					
Uplink dedicated BWP configuration			ULBWP.1					
DRx Cycle		ms	Not Applicable					
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD	-	SR.1.1 FDD	-	SR.1.1 FDD	-
	Config 2,5		SR.1.1 TDD		SR.1.1 TDD		SR.1.1 TDD	
	Config 3,6		SR2.1 TDD		SR2.1 TDD		SR2.1 TDD	
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD	-	CR.1.1 FDD	-	CR.1.1 FDD	-
	Config 2,5		CR.1.1 TDD		CR.1.1 TDD		CR.1.1 TDD	
	Config 3,6		CR2.1 TDD		CR2.1 TDD		CR2.1 TDD	
Control Channel RMC	Config 1,4		CCR.1.1 FDD	-	CCR.1.1 FDD	-	CCR.1.1 FDD	-
	Config 2,5		CCR.1.1 TDD		CCR.1.1 TDD		CCR.1.1 TDD	
	Config 3,6		CR2.1 TDD		CCR2.1 TDD		CCR2.1 TDD	
SSB configuration	Config 1,4		SSB 1.FR1	-	SSB 1.FR1	-	SSB 1.FR1	-
	Config 2,5		SSB 1.FR1		SSB 1.FR1		SSB 1.FR1	
	Config 3,6		SSB 2.FR1		SSB 2.FR1		SSB 2.FR1	
SMTC configuration			SMTC 1					
OCNG Patterns			OP.1					
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5	kHz	15 kHz					
	Config 3,6		30kHz					
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1) EPRE ratio of OCNG to OCNG DMRS (Note 1)		dB	0	0	0	0	0	0

N_{oc} Note2	Config 1,2,4,5	Depending on band group	dBm/15KhZ	-106±TT		-88±TT		-116 ±TT + Δ_{BG_offset}	
	Config 3,6	Depending on band group		-113±TT		-94±TT		116 ±TT + Δ_{BG_offset}	
N_{oc} Note2	Config 1,2,4,5		dBm/SCS	-106±TT		-88±TT		Same as Noc/15kHz	
	Config 3,6	Depending on band group		-110±TT		-91±TT		-113±TT + Δ_{BG_offset}	
$\hat{E}_s/I_{ot}$			dB	2.5±TT	-6±TT	2.5±TT	-6±TT	0.46±TT	-5.76±TT
$\hat{E}_s/N_{oc}$			dB	6±TT	1±TT	6±TT	1±TT	3±TT	-1±TT
SS-RSRP Note3	Config 1,2,4,5	Depending on band group	dBm/SCS	-100±TT	-105±TT	-82±TT	-87±TT	-113±TT + Δ_{BG_offset}	-117±TT + Δ_{BG_offset}
	Config 3,6	Depending on band group		-106±TT	-109±TT	-85±TT	-90±TT	-110±TT + Δ_{BG_offset}	-114±TT + Δ_{BG_offset}
Io Note3	Config 1,2,4,5	Depending on band group	dBm/ 9.36MHz	-70.09±TT		-52.09±TT		-82.26±TT + Δ_{BG_offset}	
	Config 3,6	Depending on band group	dBm/ 38.16MHz	-70.99±TT		-51.99±TT		-76.16±TT + Δ_{BG_offset}	
Propagation condition			-	AWGN					
Antenna configuration				1x2					
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. Note 5: Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.									

Table 4.7.1.1.1.5-2: SS-RSRP Intra frequency absolute accuracy requirements for the reported values

Normal Conditions	Test 1 All bands	Test 2 All bands	Test 3	
Lowest reported value (Cell 3)	TBD	TBD	Bands FDD_A	TBD
			Bands FDD_B1, FDD_B2	TBD
			Bands FDD_C	TBD
			Bands FDD_D	TBD
			Bands FDD_E, FDD_F	TBD
			Bands FDD_G	TBD
			Bands FDD_H	TBD
Highest reported value (Cell 3)	TBD	TBD	Bands FDD_A	TBD
			Bands FDD_B1, FDD_B2	TBD
			Bands FDD_C	TBD
			Bands FDD_D	TBD
			Bands FDD_E, FDD_F	TBD
			Bands FDD_G	TBD
			Bands FDD_D	TBD
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**	**Test 3**	
Lowest reported value (Cell 3)	TBD	TBD	Bands FDD_A	TBD
			Bands FDD_B1, FDD_B2	TBD
			Bands FDD_C	TBD
			Bands FDD_D	TBD
			Bands FDD_E, FDD_F	TBD
			Bands FDD_G	TBD
			Bands FDD_H	TBD
Highest reported value (Cell 3)	TBD	TBD	Bands FDD_A	TBD
			Bands FDD_B1, FDD_B2	TBD
			Bands FDD_C	TBD
			Bands FDD_D	TBD
			Bands FDD_E, FDD_F	TBD
			Bands FDD_G	TBD
			Bands FDD_H	TBD
Note 1: E-UTRA operating band groups are as defined in Section 3.5.				

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.1.1.2 EN-DC FR1 SS-RSRP relative measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

4.7.1.1.2.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP relative measurement accuracy is within the specified limits for all bands.

4.7.1.1.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.1.1.

4.7.1.1.2.4 Test description

4.7.1.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.1.1.2.4.1-1.

Table 4.7.1.1.2.4.1-1: EN-DC FR1 SS-RSRP measurement accuracy supported test configurations

Test Case ID	Description
4.7.1.1.2-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.1.1.2-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.1.1.2-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.1.1.2-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.1.1.2-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.1.1.2-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 4.7.1.1.2.4.1-2.

Table 4.7.1.1.2.4.1-2: Initial conditions for SS-RSRP intra frequency relative accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.1.1.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1.

4.7.1.1.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4.7.1.1.2.5-1 as appropriate.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values of Cell 2 and Cell 3 in the periodic MeasurementReport. The SS-RSRP value of Cell 3 reported by the UE is compared to the reported SS-RSRP of Cell 2. If the resulting value is outside the limits in Table 4.7.1.1.2.5-2 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Repeat steps 1-7 for each sub-test in Table 4.7.1.1.2.5-1 as appropriate.

4.7.1.1.2.4.3 Message contents

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

TBD

4.7.1.1.2.5 Test requirement

Table 4.7.1.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 4.7.1.1.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.1.1.2.5-2.

Table 4.7.1.1.2.5-1: Same as Table 4.7.1.1.1.5-1

Table 4.7.1.1.2.5-2: SS-RSRP Intra frequency relative accuracy requirements for the reported values

	Test 1	Test 2	Test 3
	All bands	All bands	All bands
Normal Conditions			
Lowest reported value (Cell 3)	RSRP_x - TBD	RSRP_x - TBD	RSRP_x - TBD
Highest reported value (Cell 3)	RSRP_x + TBD	RSRP_x + TBD	RSRP_x + TBD
Extreme Conditions			
Lowest reported value (Cell 3)	RSRP_x - TBD	RSRP_x - TBD	RSRP_x - TBD
Highest reported value (Cell 3)	RSRP_x + TBD	RSRP_x + TBD	RSRP_x + TBD
RSRP_x is the reported value of Cell 2			

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.1.2 Inter-frequency measurements

4.7.1.2.1 EN-DC FR1-FR1 SS-RSRP absolute measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- The core requirements in TS 38.133 are between [.] or TBD.

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

4.7.1.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

4.7.1.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.1.2.

4.7.1.2.1.4 Test description

4.7.1.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.1.2.1.4.1-1.

Table 4.7.1.2.1.4.1-1: EN-DC FR1-FR1 SS-RSRP measurement accuracy supported test configurations

Test Case ID	Description
4.7.1.2.1-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.1.2.1-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.1.2.1-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.1.2.1-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.1.2.1-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.1.2.1-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 4.7.1.2.1.4.1-2.

Table 4.7.1.1.1.4.1-2: Initial conditions for SS-RSRP inter frequency absolute accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.1.2.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1.

4.7.1.2.1.4.2 Test procedure

Same as in clause 4.7.1.1.1.4.2 but replacing Table 4.7.1.1.1.5-1 and 4.7.1.1.1.5-2 with 4.7.1.2.1.5-1 and 4.7.1.2.1.5-2, respectively.

4.7.1.2.1.4.3 Message contents

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

TBD

4.7.1.2.1.5 Test requirement

TBD

4.7.1.2.2 EN-DC FR1-FR1 SS-RSRP relative measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- The core requirements in TS 38.133 are between [.] or TBD.

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

4.7.1.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

4.7.1.2.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.1.2.

4.7.1.2.2.4 Test description

4.7.1.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.1.2.2.4.1-1.

Table 4.7.1.2.2.4.1-1: EN-DC FR1-FR1 SS-RSRP measurement accuracy supported test configurations

Test Case ID	Description
4.7.1.2.2-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.1.2.2-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.1.2.2-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.1.2.2-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.1.2.2-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.1.2.2-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 4.7.1.2.2.4.1-2.

Table 4.7.1.2.2.4.1-2: Initial conditions for SS-RSRP inter frequency relative accuracy in FR1

<table>
<tr><th>Parameter</th><th colspan="2">Value</th><th>Comment</th></tr>
<tr><td>Test environment</td><td colspan="2">NC, TL/VL, TL/VH, TH/VL, TH/VH</td><td>As specified in TS 38.508-1 [14] clause 4.1.</td></tr>
<tr><td>Test frequencies</td><td colspan="3">As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.</td></tr>
<tr><td>Channel bandwidth</td><td colspan="3">As specified by the test configuration selected from Table 4.7.1.2.2.4.1-1.</td></tr>
<tr><td>Propagation conditions</td><td colspan="2">AWGN</td><td>As specified in Annex C.2.2.</td></tr>
<tr><td rowspan="2">Connection Diagram</td><td>TE Part</td><td>A.3.1.8.2 with n = 2 and φ_1 = 5 Hz</td><td rowspan="2">As specified in TS 38.508-1 [14] Annex A.</td></tr>
<tr><td>DUT Part</td><td>A.3.2.3.4</td></tr>
<tr><td>Exceptions to connection diagram</td><td colspan="2">N/A</td><td></td></tr>
</table>

1. Message contents are defined in clause 4.7.1.2.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1.

4.7.1.2.2.4.2 Test procedure

Same as in clause 4.7.1.1.2.4.2 but replacing Table 4.7.1.1.2.5-1 and 4.7.1.1.2.5-2 with 4.7.1.2.2.5-1 and 4.7.1.2.2.5-2, respectively.

4.7.1.2.2.4.3 Message contents

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

TBD

4.7.1.2.2.5 Test requirement

TBD

4.7.2 SS-RSRQ

4.7.2.0 Minimum conformance requirements

4.7.2.0.1 Intra-frequency SS-RSRQ measurement accuracy requirements

TBD

4.7.2.0.2 Inter-frequency SS-RSRQ measurement accuracy requirements

TBD

4.7.2.1 EN-DC FR1 SS-RSRQ measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- The core requirements in TS 38.133 are between [.] or TBD.

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

4.7.2.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRQ measurement accuracy is within the specified limits for all bands.

4.7.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.2.1.

4.7.2.1.4 Test description

4.7.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.2.1.4.1-1.

Table 4.7.2.1.4.1-1: EN-DC FR1 SS-RSRQ measurement accuracy supported test configurations

Test Case ID	Description
4.7.2.1-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.2.1-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.2.1-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.2.1-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.2.1-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.2.1-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 4.7.2.1.4.1-2.

Table 4.7.2.1.4.1-2: Initial conditions for SS-RSRQ intra frequency accuracy in FR1

<table>
<tr><th>Parameter</th><th colspan="2">Value</th><th>Comment</th></tr>
<tr><td>Test environment</td><td colspan="2">NC, TL/VL, TL/VH, TH/VL, TH/VH</td><td>As specified in TS 38.508-1 [14] clause 4.1.</td></tr>
<tr><td>Test frequencies</td><td colspan="3">As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.</td></tr>
<tr><td>Channel bandwidth</td><td colspan="3">As specified by the test configuration selected from Table 4.7.2.1.4.1-1.</td></tr>
<tr><td>Propagation conditions</td><td colspan="2">AWGN</td><td>As specified in Annex C.2.2.</td></tr>
<tr><td rowspan="2">Connection Diagram</td><td>TE Part</td><td>A.3.1.8.2 with n = 2 and φ_1 = 5 Hz</td><td rowspan="2">As specified in TS 38.508-1 [14] Annex A.</td></tr>
<tr><td>DUT Part</td><td>A.3.2.3.4</td></tr>
<tr><td>Exceptions to connection diagram</td><td colspan="2">N/A</td><td></td></tr>
</table>

1. Message contents are defined in clause 4.7.2.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in Annex C.1.1.

4.7.2.1.4.2 Test procedure

TBD.

4.7.2.1.4.3 Message contents

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

TBD

4.7.2.1.5 Test requirement

TBD

4.7.2.2 EN-DC FR1-FR1 SS-RSRQ measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- The core requirements in TS 38.133 are between [.] or TBD.

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

4.7.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRQ measurement accuracy is within the specified limits for all bands.

4.7.2.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.2.2.

4.7.2.2.4 Test description

4.7.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.2.2.4.1-1.

Table 4.7.2.2.4.1-1: EN-DC FR1-FR1 SS-RSRQ measurement accuracy supported test configurations

Test Case ID	Description
4.7.2.2-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.2.2-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.2.2-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.2.2-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.2.2-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.2.2-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 4.7.2.2.4.1-2.

Table 4.7.2.2.4.1-2: Initial conditions for SS-RSRQ inter frequency accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.2.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in Annex C.1.1.

4.7.2.2.4.2 Test procedure

TBD

4.7.2.2.4.3 Message contents

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

TBD

4.7.2.2.5 Test requirement

TBD

4.7.3 SS-SINR

4.7.4 L1-RSRP

4.7.4.0 Minimum conformance requirements

4.7.4.0.1 SSB based absolute L1-RSRP measurement accuracy requirements

TBD

4.7.4.0.2 SSB based relative L1-RSRP measurement accuracy requirements

TBD

4.7.4.0.3 CSI-RS based absolute L1-RSRP measurement accuracy requirements

TBD

4.7.4.0.4 CSI-RS based relative L1-RSRP measurement accuracy requirements

TBD

4.7.4.1 SSB based L1-RSRP measurements

4.7.4.1.1 EN-DC FR1 SSB based L1-RSRP absolute measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- The core requirements in TS 38.133 are between [.] or TBD.

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

4.7.4.1.1.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

4.7.4.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.4.1.

4.7.4.1.1.4 Test description

4.7.4.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.4.1.1.4.1-1.

Table 4.7.4.1.1.4.1-1: EN-DC FR1 SSB based L1-RSRP absolute measurement accuracy supported test configurations

Test Case ID	Description
4.7.4.1.1-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.4.1.1-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.4.1.1-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.4.1.1-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.4.1.1-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.4.1.1-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 4.7.4.1.1.4.1-2.

Table 4.7.4.1.1.4.1-2: Initial conditions for SSB based L1-RSRP absolute accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.4.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.4.1.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for SSB base L1-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1.

4.7.4.1.1.4.2 Test procedure

TBD

4.7.4.1.1.4.3 Message contents

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

TBD

4.7.4.1.1.5 Test requirement

TBD

4.7.4.1.2 EN-DC FR1 SSB based L1-RSRP relative measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- The core requirements in TS 38.133 are between [.] or TBD.

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

4.7.4.1.2.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

4.7.4.1.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.4.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.4.1.

4.7.4.1.2.4 Test description

4.7.4.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.4.1.2.4.1-1.

Table 4.7.4.1.2.4.1-1: EN-DC FR1 SSB based L1-RSRP relative measurement accuracy supported test configurations

Test Case ID	Description
4.7.4.1.2-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.4.1.2-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.4.1.2-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.4.1.2-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.4.1.2-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.4.1.2-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 4.7.4.1.2.4.1-2.

Table 4.7.4.1.2.4.1-2: Initial conditions for SSB based L1-RSRP relative accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.4.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.4.1.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for SSB base L1-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1.

4.7.4.1.2.4.2 Test procedure

TBD

4.7.4.1.2.4.3 Message contents

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

TBD

4.7.4.1.2.5 Test requirement

TBD

4.7.4.2 CSI-RS based L1-RSRP measurements

4.7.4.2.1 EN-DC FR1 CSI-RS based L1-RSRP absolute measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- The core requirements in TS 38.133 are between [.] or TBD.

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

4.7.4.2.1.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

4.7.4.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.4.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.4.2.

4.7.4.2.1.4 Test description

4.7.4.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.4.2.1.4.1-1.

Table 4.7.4.2.1.4.1-1: EN-DC FR1 CSI-RS based L1-RSRP absolute measurement accuracy supported test configurations

Test Case ID	Description
4.7.4.2.1-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.4.2.1-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.4.2.1-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.4.2.1-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.4.2.1-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.4.2.1-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 4.7.4.2.1.4.1-2.

Table 4.7.4.2.1.4.1-2: Initial conditions for CSI-RS based L1-RSRP absolute accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.4.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.4.2.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for SSB base L1-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1.

4.7.4.2.1.4.2 Test procedure

TBD

4.7.4.2.1.4.3 Message contents

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

TBD

4.7.4.2.1.5 Test requirement

TBD

4.7.4.2.2 EN-DC FR1 CSI-RS based L1-RSRP relative measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- The core requirements in TS 38.133 are between [.] or TBD.

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

4.7.4.2.2.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

4.7.4.2.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.4.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.4.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.4.2.

4.7.4.2.2.4 Test description

4.7.4.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.4.2.2.4.1-1.

Table 4.7.4.2.2.4.1-1: EN-DC FR1 CSI-RS based L1-RSRP relative measurement accuracy supported test configurations

Test Case ID	Description
4.7.4.2.2-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.4.2.2-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.4.2.2-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.4.2.2-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.4.2.2-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.4.2.2-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 4.7.4.2.2.4.1-2.

Table 4.7.4.2.2.4.1-2: Initial conditions for CSI-RS based L1-RSRP relative accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.4.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.4.2.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for SSB base L1-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1.

4.7.4.2.2.4.2 Test procedure

TBD

4.7.4.2.2.4.3 Message contents

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

TBD

4.7.4.2.2.5 Test requirement

TBD

5 EN-DC with at least one NR cell in FR2

This section contains test scenarios for E-UTRA and NR dual connectivity with E-UTRA as PCell and NR as PSCell. This configuration is also known as NSA Option 3 and 3a. At least one NR cell is in Frequency Range 2.

5.1 Void

5.2 Void

5.3 RRC_CONNECTED state mobility

5.3.1 Void

5.3.2 RRC connection mobility control

5.3.2.1 Void

5.3.2.2 Random access

5.3.2.3 Void

5.4 Timing

5.4.1 UE transmit timing

5.4.2 UE timer accuracy

5.4.3 Timing advance

5.5 Signaling characteristics

5.5.1 Radio link monitoring

5.5.2 Interruption

5.5.2.0 Minimum conformance requirements

5.5.2.0.1 Minimum conformance requirements for interruptions at transitions between active and non-active during DRX

[TS 38.133, clause 8.2.1.2.1]

Interruption on PSCell and the activated SCell if configured due to E-UTRA PCell transitions between active and non-active druing DRX when PSCell or SCell is in non-DRX are allowed with up to 1% probability of missed ACK/NACK when the configured E-UTRA PCell DRX cycle is less than 640 ms, and 0.625% probability of missed ACK/NACK is allowed when the configured E-UTRA PCell DRX cycle is 640 ms or longer. Each interruption shall not exceed X slot as defined in table 5.5.2.0.1-1.

Each interruption shall not exceed X slot as defined in table 5.5.2.0.1-1.

Table 5.5.2.0.1-1: Interruption length X at transition between active and non-active during DRX

μ	NR Slot length (ms)	Interruption length X	
		Sync	Async
0	1	1	2
1	0.5	1	2
2	0.25	3	
3	0.125	5	

When both E-UTRA PCell and PSCell are in DRX, no interruption is allowed.

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.1.

5.5.2.0.2 Minimum conformance requirements for interruptions during measurements on deactivated NR SCC

[TS 38.133, clause 8.2.1.2.5.1]

Interruption on PSCell and other active NR SCell(s) during measurement on the deactivated NR SCC shall meet requirements in clause 8.2.2.2.3, where the term PCell in clause 8.2.2.2.3 shall be deemed to be replaced with PSCell.

[TS 38.133, clause 8.2.2.2.3]

Interruptions on PCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 5.5.2.0.2-1 if the PCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 5.5.2.0.2-2 if the PCell is in the same band as the deactivated SCell.

Interruptions on active SCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 5.5.2.0.2-1 if the active SCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 5.5.2.0.2-2 if the active SCell is in the same band as the deactivated SCell.

[TS 38.133, clause 8.2.2.2.2]

Table 5.5.2.0.2-1: Interruption duration for SCell activation/deactivation for inter-band CA

μ	NR Slot length (ms)	Interruption length
0	1	1
1	0.5	1
2	0.25	2
3	0.125	4

Table 5.5.2.0.2-2: Interruption duration for SCell activation/deactivation for intra-band CA

μ	NR Slot length (ms)	Interruption length
0	1	$1 + T_{SMTC\_duration}$
1	0.5	$1 + T_{SMTC\_duration}$
2	0.25	$2 + T_{SMTC\_duration}$
3	0.125	$4 + T_{SMTC\_duration}$
Note:	$T_{SMTC\_duration}$ is - the longest SMTC duration among all above activated serving cells and the SCell being activated when one SCell is activated; - the longest SMTC duration among all activated serving cells in the same band when one SCell is deactivated.	

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.5.1.

5.5.2.0.3 Minimum conformance requirements for interruptions during measurements on deactivated E-UTRAN SCC

[TS 38.133 clause 8.2.1.2.5.2]

When one E-UTRA SCell in MCG is deactivated, the UE is allowed due to measurements on the E-UTRA SCC with the deactivated E-UTRA SCell:

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK when any of the configured *measCycleSCell* [2] for the deactivated E-UTRA SCells is 640 ms or longer.

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK regardless of the configured *measCycleSCell* [2] for the deactivated E-UTRA SCells if indicated by the network using IE *allowInterruptions* [2].

Each interruption shall not exceed

- X3 slot, if the PSCell or activated SCell is not in the same band as the E-UTRA deactivated SCC being measured, or

- Y3 slot + SMTC duration, if the PSCell or activated SCell is in the same band as the E-UTRA deactivated SCC being measured, provided the cell specific reference signals from the PSCell or activated SCell and the E-UTRA deactivated SCC being measured are available in the same slot.

Table 5.5.2.0.3-1: Interruption length X3 and Y3 at measurements on deactivated E-UTRA SCC

μ	NR Slot length (ms)	Interruption length X3 slot	Interruption length Y3 slot
0	1	1	1
1	0.5	1	1
2	0.25	2	2
3	0.125	4	4

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.5.1.

5.5.2.1 EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Editor's note:

- Message contents are missing.

- Some parts of TC is TBD.

- Connection diagram is TBD.

- Test tolerance is missing.

- Cell mapping is missing

5.5.2.1.1 Test purpose

The purpose of this test is to verify EN-DC UE's ability to complete PSCell interruption during LTE PCell DRX transitions within the missed ACK/NACK rate for NR PSCell in EN-DC requirements.

5.5.2.1.2 Test applicability

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

5.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.1.

5.5.2.1.4 Test description

5.5.2.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 5.5.2.1.4.1-1.

Table 5.5.2.1.4.1-1: Supported test configurations for EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Configuration	Description
5.5.2.1-1	LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.2.1-2	LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.1.4.1-2.

Table 5.5.2.1.4.1-2: Initial conditions for EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.2.1.4.1-3.

2. Message contents are defined in clause 5.5.2.1.4.3.

3. There are one E-UTRAN carrier and one NR carrier and two cells in the test. Cell 1 is PCell on the E-UTRAN carrier, Cell 2 is PSCell on the NR carrier, Cell 1 is the cell used for connection setup with the power levels set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to Annex C.1.1 and C.1.2.

Table 5.5.2.1.4.1-3: General test parameters for EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1 and cell 2
DRX		ON	DRX related parameters are defined in Table A.5.5.2.1.1-3
Measurement gap pattern Id		OFF	
T1	s	10	

5.5.2.1.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1 and Cell2. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell.

1. Ensure the UE is in state FFS according to TS 38.508-1 [14] clause FFS.

2. Configure MCG according to TS 36.521-3 [26] Annex C.0, C.1 and SCG according to Annex C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall transmit an RRCConnectionReconfiguration message to configure PCell (Cell1) and PSCell (Cell2) on the MCG and SCG as per TS 36.508 [7] clause FFS with the message content exceptions defined in clause 5.5.2.1.4.3.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. The SS would ensure continuous transmission on PSCell, while not scheduling on PCell at least for 200 ms to ensure inactivity timer is expired on the UE for LTE PCell.

5. Set the parameters according to T1 in Table 5.5.2.1.5-1. Propagation conditions are set according to Annex C.2.1. T1 starts.

6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.

7. If more than 99% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.

8. If no two consecutive DTX is observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”.

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS. (if the paging fails, switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS),

   or

   - switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS.

10. Repeat step 3-9 until a test verdict has been achieved

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is

achieved. Different events may require different times for a verdict.
If all events pass, the test passes. If one event fails, the test fails.

5.5.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 5.5.2.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

5.5.2.1.5 Test requirement

Table 5.5.2.1.4.1-1 and 5.5.2.1.5-1 define the primary level settings including test tolerances for EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC test.

Table 5.5.2.1.5-1: NR cell specific test parameters for EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parameter		Unit	Cell 2
Connection Type			Conducted
Frequency Range			FR2
Duplex mode	Config 1,2		TDD
TDD configuration	Config 1,2		TBD
$BW_{channel}$	Config 1,2	MHz	100: $N_{RB,c}$ = 66
Initial BWP Configuration	Config 1,2		TBD
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD
RMSI CORESET parameters	Config 1,2		CR.3.1 TDD
PDCCH CORESET parameters	Config 1,2		TBD
OCNG Patterns			OP.1
SMTC Configuration	Config 1,2		SMTC.1 FR2
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
$\hat{E}_s/N_{oc}$		dB	TBD+TT TBD
Propagation Condition			AWGN
Time offset to cell1 Note 2		μs	3
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells			

Table 5.5.2.1.5-2: NR cell specific OTA related test parameters for EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parameter		Unit	Cell 2
UE orientation around TBD axis and TBD axis			TBD
Relative difference in angle of arrival of cell 2 relative to cell 1		degrees	TBD
	NR_TDD_FR2_A	dBm/15kHz Note4	TBD+TT
	NR_TDD_FR2_B		

N_{oc} Note1	NR_TDD_FR2_C		
	NR_TDD_FR2_D		
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
N_{oc} Note1	NR_TDD_FR2_A	dBm/SCS Note3	TBD+TT
	NR_TDD_FR2_B		
	NR_TDD_FR2_C		
	NR_TDD_FR2_D		
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
SS-RSRP Note2	NR_TDD_FR2_A	dBm/SCS Note4	TBD+TT
	NR_TDD_FR2_B		
	NR_TDD_FR2_C		
	NR_TDD_FR2_D		
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
$\hat{E}_s/I_{ot}$		dB	TBD+TT
Io Note2	NR_TDD_FR2_A	dBm/95.04 MHz Note4	TBD+TT

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the center of the quiet zone
Note 5: As observed with 0dBi gain antenna at the center of the quiet zone

Table 5.5.2.1.5-3: E-UTRAN PCell DRX-Configuration for EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Field	Cell1 Value	Comment
onDurationTimer	psf1	As specified in clause 6.3.2 in TS 36.331
drx-InactivityTimer Note 1	psf1	
drx-RetransmissionTimer	psf1	
longDRX-CycleStartOffset	Sf160	
shortDRX	disable	

Note 1: UE is continuously scheduled in NR PSCell

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed 0.625ms (5 slots) as defined in section TS 38.133 8.2.1.

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

5.5.2.2 EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Editor's note:

- Message contents are missing.

- Some parts of TC is TBD.

- Connection diagram is TBD.

- Test tolerance is missing.

- Cell mapping is missing

5.5.2.2.1 Test purpose

The purpose of this test is to verify EN-DC UE's ability to complete PSCell interruption during LTE PCell DRX transitions within the missed ACK/NACK rate for NR PSCell in EN-DC requirements.

5.5.2.2.2 Test applicability

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

5.5.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.2.

5.5.2.2.4 Test description

5.5.2.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 5.5.2.2.4.1-1.

Table 5.5.2.2.4.1-1: Supported test configurations for EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Configuration	Description
5.5.2.2-1	LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.2.2-2	LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.2.4.1-2.

Table 5.5.2.2.4.1-2: Initial conditions for EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.2.2.4.1-3.
2. Message contents are defined in clause 5.5.2.2.4.3.
3. There are one E-UTRAN carrier and one NR carrier and two cells in the test. Cell 1 is PCell on the E-UTRAN carrier, Cell 2 is PSCell on the NR carrier, Cell 1 is the cell used for connection setup with the power levels set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to Annex C.1.1 and C.1.2.

Table 5.5.2.2.4.1-3: General test parameters for EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1 and cell 2
DRX		ON	DRX related parameters are defined in Table A.5.5.2.2.1-3
Measurement gap pattern Id		OFF	
T1	s	10	

5.5.2.2.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1 and Cell2. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell.

1. Ensure the UE is in state FFS according to TS 38.508-1 [14] clause FFS.

2. Configure MCG according to TS 36.521-3 [26] Annex C.0, C.1 and SCG according to Annex C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall transmit an RRCConnectionReconfiguration message to configure PCell (Cell1) and PSCell (Cell2) on the MCG and SCG as per TS 36.508 [7] clause FFS with the message content exceptions defined in clause 5.5.2.2.4.3.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. The SS would ensure continuous transmission on PSCell, while not scheduling on PCell at least for 200 ms to ensure inactivity timer is expired on the UE for LTE PCell.

5. Set the parameters according to T1 in Table 5.5.2.2.5-1. Propagation conditions are set according to Annex C.2.1. T1 starts.

6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.

7. If more than 99% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.

8. If no two consecutive DTX is observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”.

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS. (if the paging fails, switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS),

   or

   - switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS.

10. Repeat step 3-9 until a test verdict has been achieved

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is

achieved. Different events may require different times for a verdict.
If all events pass, the test passes. If one event fails, the test fails.

5.5.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 5.5.2.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

5.5.2.2.5 Test requirement

Table 5.5.2.2.4.1-1 and 5.5.2.2.5-1 define the primary level settings including test tolerances for EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC test.

Table 5.5.2.2.5-1: NR cell specific test parameters for EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Parameter		Unit	Cell 2
Connection Type			Conducted
Frequency Range			FR2
Duplex mode	Config 1,2		TDD
TDD configuration	Config 1,2		TBD
$BW_{channel}$	Config 1,2	MHz	100: $N_{RB,c}$ = 66
Initial BWP Configuration	Config 1,2		TBD
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD
RMSI CORESET parameters	Config 1,2		CR.3.1 TDD
PDCCH CORESET parameters	Config 1,2		TBD
OCNG Patterns			OP.1
SMTC Configuration	Config 1,2		SMTC.1 FR2
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
$\hat{E}_s/N_{oc}$		dB	TBD+TT TBD
Propagation Condition			AWGN
Time offset to cell1 Note 2		ms	3
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells			

Table 5.5.2.2.5-2: NR cell specific OTA related test parameters for EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Parameter		Unit	Cell 2
UE orientation around TBD axis and TBD axis			TBD
Relative difference in angle of arrival of cell 2 relative to cell 1		degrees	TBD
	NR_TDD_FR2_A	dBm/15kHz Note4	TBD+TT
	NR_TDD_FR2_B		

N_{oc} Note1	NR_TDD_FR2_C		
	NR_TDD_FR2_D		
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
N_{oc} Note1	NR_TDD_FR2_A	dBm/SCS Note3	TBD+TT
	NR_TDD_FR2_B		
	NR_TDD_FR2_C		
	NR_TDD_FR2_D		
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
SS-RSRP Note2	NR_TDD_FR2_A	dBm/SCS Note4	TBD+TT
	NR_TDD_FR2_B		
	NR_TDD_FR2_C		
	NR_TDD_FR2_D		
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
$\hat{E}_s/I_{ot}$		dB	TBD+TT
Io Note2	NR_TDD_FR2_A	dBm/95.04 MHz Note4	TBD+TT
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. Note 4: Equivalent power received by an antenna with 0dBi gain at the center of the quiet zone Note 5: As observed with 0dBi gain antenna at the center of the quiet zone			

Table 5.5.2.2.5-3: E-UTRAN PCell DRX-Configuration for EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Field	Cell1	Comment
	Value	
onDurationTimer	psf1	As specified in clause 6.3.2 in TS 36.331
drx-InactivityTimer Note 1	psf1	
drx-RetransmissionTimer	psf1	
longDRX-CycleStartOffset	Sf160	
shortDRX	disable	
Note 1: UE is continuously scheduled in NR PSCell		

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed 0.625ms (5 slots) as defined in TS 38.133 section 8.2.1.

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

5.5.2.3 EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Editor's note:

- Message contents are missing.

- Some parts of TC is TBD.

- Connection diagram is TBD.

- Test tolerance is missing.

- Cell mapping is missing

5.5.2.3.1 Test purpose

The purpose of this test is to verify EN-DC UE's ability to complete PSCell interruptions during the measurement on the deactivated NR SCC within the missed ACK/NACK rate for NR PSCell in EN-DC requirements.

5.5.2.3.2 Test applicability

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

5.5.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.3.

5.5.2.3.4 Test description

5.5.2.3.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 5.5.2.3.4.1-1.

Table 5.5.2.3.4.1-1: Supported test configurations for EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Configuration	Description
5.5.2.3-1	LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.2.3-2	LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.3.4.1-2.

Table 5.5.2.3.4.1-2: Initial conditions for EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.2.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.2.3.4.1-3.
2. Message contents are defined in clause 5.5.2.3.4.3.
3. There are one E-UTRAN carrier and two NR carriers and three cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on one NR carrier and Cell 3 is the SCell on the other NR carrier. Cell 1 is the cell used for connection setup with the power level set according to [TBD]. Cell 2 and Cell 3 shall be configured according to [TBD].

Table 5.5.2.3.4.1-3: General test parameters for EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated SCell		Cell3	Deactivated SCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	s	10	

5.5.2.3.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN PCell, Cell2 is NR PSCell and Cell3 is deactivated NR SCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1, Cell2 and Cell3. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as NR deactivated SCell. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received by the UE, defines the start of time period T1. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state FFS according to TS 38.508-1 [14] clause TBD.
2. Configure MCG according to TS 36.521-3 [26] Annex C.0, C.1 and SCG according to Annex C.1.1 and C.1.2 for all downlink physical channels.
3. The SS shall transmit an RRCConnectionReconfiguration message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCell.
4. The UE shall transmit RRCConnectionReconfigurationComplete message.
5. Set the parameters according to T1 in Table 5.5.2.3.5-1. Propagation conditions are set according to Annex C.2.1. T1 starts.
6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.
7. If more than 99.5% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.
8. If no two consecutive DTX is observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”.
9. After the RRC connection release, the SS:
    - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS. (if the paging fails, switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS),

    or

    - switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS.
10. Repeat step 3-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

5.5.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 5.5.2.3.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

5.5.2.3.5 Test requirement

Table 5.5.2.3.5-1 and Table 5.5.2.3.5-2 define the primary level settings including test tolerances for FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC test configurations.

Table 5.5.2.3.5-1: NR cell specific test parameters for EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter		Unit	Cell 2	Cell 3
Connection Type			Conducted	Conducted
Frequency Range			FR2	FR2
Duplex mode	Config 1		FDD	FDD
	Config 2		TDD	TDD
TDD configuration	Config 1		N.A	N.A
	Config 2		TBD	TBD
$BW_{channel}$	Config 1,2	MHz	100: $N_{RB,c}$ = 66	100: $N_{RB,c}$ = 66
Initial BWP Configuration	Config 1,2		TBD	TBD
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD	-
RMSI CORESET parameters	Config 1,2		CR.3.1 TDD	CR.3.1 TDD
PDCCH CORESET parameters	Config 1,2		TBD	TBD
OCNG Patterns			OP.1	OP.1
SMTC Configuration	Config 1,2		SMTC.1 FR2	SMTC.1 FR2
EPRE ratio of PSS to SSS		dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
$\hat{E}_s/N_{oc}$		dB	TBD	TBD
Propagation Condition			AWGN	AWGN
Time offset to cell1 Note 2		µs	3	3
Time offset to cell1 Note 3		µs	-	3
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells Note 3: Receive time difference of signals received between slot timing boundary from two NR Cells including time alignment error between the two cells				

Table 5.5.2.3.5-2: NR cell specific OTA related test parameters for EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter		Unit	Cell 2	Cell 3
UE orientation around TBD axis and TBD axis			TBD	
Relative difference in angle of arrival of cell 2 and cell 3 relative to cell 1		degrees	TBD	
N_{oc} Note1	NR_TDD_FR2_A	dBm/15kHz Note4	TBD+TT	TBD+TT
	NR_TDD_FR2_B			
	NR_TDD_FR2_C			
	NR_TDD_FR2_D			
	NR_TDD_FR2_E			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
N_{oc} Note1	NR_TDD_FR2_A	dBm/SCS Note3	TBD+TT	TBD+TT
	NR_TDD_FR2_B			
	NR_TDD_FR2_C			
	NR_TDD_FR2_D			
	NR_TDD_FR2_E			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
SS-RSRP Note2	NR_TDD_FR2_A	dBm/SCS Note4	TBD+TT	TBD+TT
	NR_TDD_FR2_B			
	NR_TDD_FR2_C			
	NR_TDD_FR2_D			
	NR_TDD_FR2_E			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
$\hat{E}_s/I_{ot}$		dB	TBD+TT	TBD+TT
Io Note2	NR_TDD_FR2_A	dBm/95.04 MHz Note4	TBD+TT	TBD+TT
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. Note 4: Equivalent power received by an antenna with 0dBi gain at the center of the quiet zone Note 5: As observed with 0dBi gain antenna at the center of the quiet zone				

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 5.5.2.3.5-3 and Table 5.5.2.3.5-4.

Table 5.5.2.3.5-3: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
3	0.125	4

Table 5.5.2.3.5-4: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
3	0.125	8 + SMTC duration

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

5.5.2.4 EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Editor's note:

- Message contents are not complete.

- There are TBD in test case.

- Connection diagram is TBD.

- Test tolerance is missing.

- Cell mapping is missing

5.5.2.4.1 Test purpose

The purpose of this test is to verify EN-DC UE's ability to complete PSCell interruptions during the measurement on the deactivated NR SCC within the missed ACK/NACK rate for NR PSCell in EN-DC requirements.

5.5.2.4.2 Test applicability

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

5.5.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.4.

5.5.2.4.4 Test description

5.5.2.4.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 5.5.2.4.4.1-1.

Table 5.5.2.4.4.1-1: Supported test configurations for EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Configuration	Description
5.5.2.4-1	LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.2.4-2	LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.4.4.1-2.

Table 5.5.2.4.4.1-2: Initial conditions for EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.2.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.2.4.4.1-3.
2. Message contents are defined in clause 5.5.2.4.4.3.
3. There are one E-UTRAN carrier and two NR carriers and three cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on one NR carrier and Cell 3 is the SCell on the other NR carrier. Cell 1 is the cell used for connection setup with the power level set according to [TBD]. Cell 2 and Cell 3 shall be configured according to [TBD].

Table 5.5.2.4.4.1-3: General test parameters for EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated SCell		Cell3	Deactivated SCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1, cell 2 and cell3
AoA number		1	Applicable to cell2 and cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	s	10	

5.5.2.4.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN PCell, Cell2 is NR PSCell and Cell3 is deactivated NR SCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1, Cell2 and Cell3. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as NR deactivated SCell. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received by the UE, defines the start of time period T1. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state FFS according to TS 38.508-1 [14] clause TBD.
2. Configure MCG according to TS 36.521-3 [26] Annex C.0, C.1 and SCG according to Annex C.1.1 and C.1.2 for all downlink physical channels.
3. The SS shall transmit an RRCConnectionReconfiguration message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCell.
4. The UE shall transmit RRCConnectionReconfigurationComplete message.
5. Set the parameters according to T1 in Table 5.5.2.4.5-1. Propagation conditions are set according to Annex C.2.1. T1 starts.
6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.
7. If more than 99.5% of uplink transmissions are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".
8. If no two consecutive DTX is observed by the SS, then count a success for the event "DTX". Otherwise count a fail for the event "DTX".
9. After the RRC connection release, the SS:

- transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS. (if the paging fails, switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS),

or

- switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS.

10. Repeat step 3-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

5.5.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 5.5.2.4.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

5.5.2.4.5 Test requirement

Table 5.5.2.4.5-1 and Table 5.5.2.4.5-2 define the primary level settings including test tolerances for FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC test configurations.

Table 5.5.2.4.5-1: NR cell specific test parameters for EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter		Unit	Cell 2	Cell 3
Connection Type			Conducted	Conducted
Frequency Range			FR2	FR2
Duplex mode	Config 1		FDD	FDD
	Config 2		TDD	TDD
TDD configuration	Config 1		N.A	N.A
	Config 2		TBD	TBD

$BW_{channel}$	Config 1,2	MHz	100: $N_{RB,c}$ = 66	100: $N_{RB,c}$ = 66
Initial BWP Configuration	Config 1,2		TBD	TBD
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD	-
RMSI CORESET parameters	Config 1,2		CR.3.1 TDD	CR.3.1 TDD
PDCCH CORESET parameters	Config 1,2		TBD	TBD
OCNG Patterns			OP.1	OP.1
SMTC Configuration	Config 1,2		SMTC.1 FR2	SMTC.1 FR2
EPRE ratio of PSS to SSS		dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
$\hat{E}_s/N_{oc}$		dB	TBD	TBD
Propagation Condition			AWGN	AWGN
Time offset to cell1 Note 2		ms	3	3
Time offset to cell1 Note 3		µs	-	3
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells Note 3: Receive time difference of signals received between slot timing boundary from two NR Cells including time alignment error between the two cells				

Table 5.5.2.4.5-2: NR cell specific OTA related test parameters for EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter		Unit	Cell 2	Cell 3
UE orientation around TBD axis and TBD axis			TBD	
Relative difference in angle of arrival of cell 2 and cell 3 relative to cell 1		degrees	TBD	
N_{oc} Note1	NR_TDD_FR2_A	dBm/15kHz Note4	TBD+TT	TBD+TT
	NR_TDD_FR2_B			
	NR_TDD_FR2_C			
	NR_TDD_FR2_D			
	NR_TDD_FR2_E			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
N_{oc} Note1	NR_TDD_FR2_A	dBm/SCS Note3	TBD+TT	TBD+TT
	NR_TDD_FR2_B			
	NR_TDD_FR2_C			
	NR_TDD_FR2_D			
	NR_TDD_FR2_E			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
SS-RSRP Note2	NR_TDD_FR2_A	dBm/SCS Note4	TBD+TT	TBD+TT
	NR_TDD_FR2_B			
	NR_TDD_FR2_C			
	NR_TDD_FR2_D			
	NR_TDD_FR2_E			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			

$\hat{E}_s/I_{ot}$		dB	TBD+TT	TBD+TT
Io[Note2]	NR_TDD_FR2_A	dBm/95.04 MHz Note4	TBD+TT	TBD+TT
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. Note 4: Equivalent power received by an antenna with 0dBi gain at the center of the quiet zone Note 5: As observed with 0dBi gain antenna at the center of the quiet zone				

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 5.5.2.4.5-3 and Table 5.5.2.4.5-4.

Table 5.5.2.4.5-3: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
3	0.125	4

Table 5.5.2.4.2-4: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
3	0.125	8 + SMTC duration

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

5.5.2.5 EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Editor's note:

- Message contents are missing.
- Some parts of TC is TBD.
- Connection diagram is TBD.
- Test tolerance is missing.
- Cell mapping is missing

5.5.2.5.1 Test purpose

The purpose of this test is to verify EN-DC UE's ability to complete PSCell interruptions during the measurement on E-UTRAN SCC within the missed ACK/NACK rate for NR PSCell in EN-DC requirements.

5.5.2.5.2 Test applicability

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

5.5.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.5.

5.5.2.5.4 Test description

5.5.2.5.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 5.5.2.5.4.1-1.

Table 5.5.2.5.4.1-1: Supported test configurations for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Configuration	**Description**
5.5.2.5-1	LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.2.5-2	LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.5.4.1-2.

Table 5.5.2.5.4.1-2: Initial conditions for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Parameter	**Value**		**Comment**
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.2.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.2.5.4.1-3.
2. Message contents are defined in clause 5.5.2.5.4.3.
3. There are two E-UTRAN carriers and one NR carrier and three cells specified in the test. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR2 PSCell. Cell 1 is the cell used for connection setup with the power level set according to [TBD]. Cell 2 and Cell 3 shall be configured according to [TBD].

Table 5.5.2.5.4.1-3: General test parameters for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Parameter	**Unit**	**Value**	**Comment**
RF Channel Number		1, 2	One is E-UTRAN RF channel and the other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated SCell		Cell3	Deactivated SCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	s	10	

5.5.2.5.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR2 PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1, Cell2 and Cell3. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as NR deactivated SCell. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the E-UTRAN NR SCells is received by the UE, defines the start of time period T1. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state FFS according to TS 38.508-1 [14] clause TBD.
2. Configure MCG according to TS 36.521-3 [26] Annex C.0, C.1 and SCG according to Annex C.1.1 and C.1.2 for all downlink physical channels.
3. The SS shall transmit an RRCConnectionReconfiguration message including measCycleSCell or allowInterruptions for the deactivated NR SCell to perform measurements on the deactivated SCC.
4. The UE shall transmit RRCConnectionReconfigurationComplete message.
5. Set the parameters according to T1 in Table 5.5.2.5.5-1. Propagation conditions are set according to Annex C.2.1. T1 starts.
6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.
7. If more than 99.5% of uplink transmissions are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".
8. If no two consecutive DTX is observed by the SS, then count a success for the event "DTX". Otherwise count a fail for the event "DTX".
9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS. (if the paging fails, switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS),

   or

   - switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS.
10. Repeat step 3-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

5.5.2.5.4.3 Message contents

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

Table 5.5.2.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

5.5.2.5.5 Test requirement

Table 5.5.2.5.5-1 defines the primary level settings including test tolerances for E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC test configurations.

Table 5.5.2.5.5-1: NR cell specific test parameters for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Parameter		Unit	Cell 2
Connection Type			Conducted
Frequency Range			FR2
Duplex mode	Config 1,2		TDD
TDD configuration	Config 1,2		TBD
$BW_{channel}$	Config 1,2	MHz	100: $N_{RB,c}$ = 66
Initial BWP Configuration	Config 1,2		TBD
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD
RMSI CORESET parameters	Config 1,2		CR.3.1 TDD
PDCCH CORESET parameters	Config 1,2		TBD
OCNG Patterns			OP.1
SMTC Configuration	Config 1,2		SMTC.1 FR2
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
$\hat{E}_s/N_{oc}$		dB	TBD+TT
Propagation Condition			AWGN
Time offset to cell1 Note 2		µs	3
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells			

Table 5.5.2.5.5-2: NR cell specific OTA related test parameters for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Parameter		Unit	Cell 2
UE orientation around TBD axis and TBD axis			TBD
Relative difference in angle of arrival of cell 2 relative to cell 1		degrees	TBD
N_{oc} Note1	NR_TDD_FR2_A	dBm/15kHz Note4	TBD+TT
	NR_TDD_FR2_B		
	NR_TDD_FR2_C		
	NR_TDD_FR2_D		
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
N_{oc} Note1	NR_TDD_FR2_A	dBm/SCS Note3	TBD+TT
	NR_TDD_FR2_B		
	NR_TDD_FR2_C		
	NR_TDD_FR2_D		
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
SS-RSRP Note2	NR_TDD_FR2_A	dBm/SCS Note4	TBD+TT
	NR_TDD_FR2_B		
	NR_TDD_FR2_C		
	NR_TDD_FR2_D		
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		

$\hat{E}_s/I_{ot}$		dB	TBD+TT
Io[Note2]	NR_TDD_FR2_A	dBm/95.04 MHz [Note4]	TBD+TT
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. Note 4: Equivalent power received by an antenna with 0dBi gain at the center of the quiet zone Note 5: As observed with 0dBi gain antenna at the center of the quiet zone			

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 5.5.2.5.5-3 and Table 5.5.2.5.5-4.

Table 5.5.2.5.5-3: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
3	0.125	5

Table 5.5.2.5.5-4: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
3	0.125	4 + SMTC duration

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

5.5.2.6 EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Editor's note:

- Message contents are missing.

- Some parts of TC is TBD.

- Connection diagram is TBD.

- Test tolerance is missing.

- Cell mapping is missing

5.5.2.6.1 Test purpose

The purpose of this test is to verify EN-DC UE's ability to complete PSCell interruptions during the measurement on E-UTRAN SCC within the missed ACK/NACK rate for NR PSCell in EN-DC requirements.

5.5.2.6.2 Test applicability

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

5.5.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.6.

5.5.2.6.4 Test description

5.5.2.6.4.1 Initial conditions

Test 5.5.2.6 can be run in one of the configurations defined in Table 5.5.2.6.4.1-1.

Table 5.5.2.6.4.1-1: Supported test configurations for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Configuration	Description
5.5.2.6-1	LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.2.6-2	LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.6.4.1-2.

Table 5.5.2.6.4.1-2: Initial conditions for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.2.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

2. The general test parameter settings are set up according to Table 5.5.2.6.4.1-3.

4. Message contents are defined in clause 5.5.2.6.4.3.

5. There are two E-UTRAN carriers and one NR carrier and three cells specified in the test. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR2 PSCell. Cell 1 is the cell used for connection setup with the power level set according to [TBD]. Cell 2 and Cell 3 shall be configured according to [TBD].

Table 5.5.2.6.4.1-3: General test parameters for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated SCell		Cell3	Deactivated SCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	s	10	

5.5.2.6.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR2 PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1, Cell2 and Cell3. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as NR deactivated SCell. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the E-UTRAN NR SCells is received by the UE, defines the start of time period T1. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state FFS according to TS 38.508-1 [14] clause TBD.
2. Configure MCG according to TS 36.521-3 [26] Annex C.0, C.1 and SCG according to Annex C.1.1 and C.1.2 for all downlink physical channels.
3. The SS shall transmit an RRCConnectionReconfiguration message including measCycleSCell or allowInterruptions for the deactivated NR SCell to perform measurements on the deactivated SCC.
4. The UE shall transmit RRCConnectionReconfigurationComplete message.
5. Set the parameters according to T1 in Table 5.5.2.6.5-1. Propagation conditions are set according to Annex C.2.1. T1 starts.
6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.
7. If more than 99.5% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.
8. If no two consecutive DTX is observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”.
9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS. (if the paging fails, switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS),

   or

   - switches off and on the UE and ensures the UE is in state FFS TS 38.508-1 [14] clause FFS.
10. Repeat step 3-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

5.5.2.6.4.3 Message contents

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

Table 5.5.2.6.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

5.5.2.6.5 Test requirement

Table 5.5.2.6.5-1 defines the primary level settings including test tolerances for E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC test configurations.

Table 5.5.2.6.5-1: NR cell specific test parameters for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Parameter		Unit	Cell 2
Connection Type			Conducted
Frequency Range			FR2
Duplex mode	Config 1,2		TDD
TDD configuration	Config 1,2		TBD
$BW_{channel}$	Config 1,2	MHz	100: $N_{RB,c}$ = 66
Initial BWP Configuration	Config 1,2		TBD
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD
RMSI CORESET parameters	Config 1,2		CR.3.1 TDD
PDCCH CORESET parameters	Config 1,2		TBD
OCNG Patterns			OP.1
SMTC Configuration	Config 1,2		SMTC.1 FR2
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
$\hat{E}_s/N_{oc}$		dB	TBD
Propagation Condition			AWGN
Time offset to cell1 Note 2		ms	3
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells			

Table 5.5.2.6.5-2: NR cell specific OTA related test parameters for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Parameter		Unit	Cell 2
UE orientation around TBD axis and TBD axis			TBD
Relative difference in angle of arrival of cell 2 relative to cell 1		degrees	TBD
N_{oc} Note1	NR_TDD_FR2_A	dBm/15kHz Note4	TBD
	NR_TDD_FR2_B		
	NR_TDD_FR2_C		
	NR_TDD_FR2_D		
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
N_{oc} Note1	NR_TDD_FR2_A	dBm/SCS Note3	TBD
	NR_TDD_FR2_B		
	NR_TDD_FR2_C		
	NR_TDD_FR2_D		
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
SS-RSRP Note2	NR_TDD_FR2_A	dBm/SCS Note4	TBD
	NR_TDD_FR2_B		
	NR_TDD_FR2_C		
	NR_TDD_FR2_D		
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		

$\hat{E}_s/I_{ot}$		dB	TBD
Io[Note2]	NR_TDD_FR2_A	dBm/95.04 MHz [Note4]	TBD

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the center of the quiet zone
Note 5: As observed with 0dBi gain antenna at the center of the quiet zone

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 5.5.2.6.5-3 and Table 5.5.2.6.5-4.

Table 5.5.2.6.5-3: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
3	0.125	5

Table 5.5.2.6.5-4: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
3	0.125	4 + SMTC duration

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

5.5.3 SCell activation and deactivation delay

5.5.3.1 EN-DC FR2 SCell activation and deactivation intra-band in non-DRX

Editor's notes: This clause is incomplete, the following items are TBD

- *The core requirements in TS 38.133 are between [.] or TBD;*
- *Test tolerance analysis is missing;*
- *Test procedure and Message content are TBD;*
- *Cell mapping and Connection diagram is TBD;*
- *Test applicability Table in TS38.522 need to be updated.*

5.5.3.1.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements, when the SCell in FR2 intra-band is known by the UE at the time of activation.

5.5.3.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

5.5.3.1.3 Minimum conformance requirements

Same minimum conformance requirements as described in section 4.5.3.1.3.

The normative reference for this requirement is TS 38.133 [6] clause 8.3 and A.5.5.3.1.

5.5.3.1.4 Test description

5.5.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.3.1.4.1-1.

Table 5.5.3.1.4.1-1: Supported test configurations for FR2 SCell activation case

Test Case ID	Description
5.5.3.1-1	FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.3.1-2	TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to pass in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 5.5.3.1.4.1-2 and Table 5.5.3.1.4.1-3.

Table 5.5.3.1.4.1-2: Initial conditions for known FR2 SCell activation case

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.1.2-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	N/A		

Table 5.5.3.1.4.1-3: General test parameters for FR2 SCell activation case

Parameter	Unit	Value	Comment
RF Channel Number		1,2,3	One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test
Active PCell		Cell 1	Primary cell on E-UTRAN RF channel number 1. As specified in section A.3.7.2.2 of TS38.133 [6]
Active PSCell		Cell 2	Primary secondary cell on NR RF channel number 2.
Configured deactivated SCell		Cell 3	Configured deactivated secondary cell on NR RF channel number 3
CP length		Normal	
DRX		OFF	Continuous monitoring of primary cell
CQI/PMI periodicity and offset configuration index		0	CQI reporting for SCell every second subframe
Cell-individual offset for cells on E-UTRA RF channel number	dB	0	Individual offset for cells on primary component carrier.
Cell-individual offset for cells on NR channel number	dB	0	Individual offset for cells on secondary component carrier.
SCell measurement cycle (measCycleSCell)	ms	160	
Cell3 timing offset to cell2	µs	0	
Time alignment error between cell3 and cell2	µs	≤ Time alignment error as specified in 3GPP TS 38.104 [xx] clause 6.5.3.1. Editor's note: spec is not listed!	The value of time alignment error depends upon the type of carrier aggregation.
T1	s	[7]	During this time the PSCell shall be known and the SCell configured and detected.
T2	s	[1]	During this time the UE shall activate the SCell.
T3	s	[1]	During this time the UE shall deactivate the SCell.
T_{HARQ}	ms	TBD	the timing between DL data transmission and acknowledgement as specified in 38.321 [12]
$T_{CSI\_Reporting}$	ms	[2]	the delay uncertainty in acquiring the first available CSI reporting resources as specified in 38.331 [13]
k	ms	TBD	As specified in section 4.3 of TS38.213 [8]

1. Message contents are defined in clause 5.5.3.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR2 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the deactivated SCell.

5.5.3.1.4.2 Test procedure

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, E-UTRA has one cell, NR has two cells. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

During T2 the Test procedure requires the UE to send the first CSI report for SCell1 in a subframe (m+[k]), but also allows a subframe not happen outside the slot (m+1+[T_{HARQ}]) to (m+1+[T_{HARQ}+3ms+T_{SSB_max}+$T_{SMTC\_duration}$]) if the subframe (m+[k]) was subject to interruption. The SS determines whether the CSI report in subframe (m+[k]) was interrupted or not by monitoring ACK/NACK sent in PSCell in subframe (m+[k]).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG according to TS 38.508-1 [14] clause 4.5.

2. TBD.

5.5.3.1.4.3 Message contents

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

TBD

5.5.3.1.5 Test requirement

Table 5.5.3.1.5-1 and Table 5.5.3.1.5-2 defines the primary level settings including test tolerances for all tests.

Table 5.5.3.1.5-1: Cell specific test parameters for FR2 SCell activation case

Parameter[Note 5]	Unit	Cell 2			Cell 3		
		T1	T2	T3	T1	T2	T3
SSB ARFCN		freq2			freq2		
Duplex mode		TDD			TDD		
TDD configuration		TDDConf.3.1			TDDConf.3.1		
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66			100: $N_{RB,c}$ = 66		
PDSCH Reference measurement channel		SR.3.1 TDD			SR.3.1 TDD		
RMSI CORESET Reference Channel		CR.3.1 TDD			CR.3.1 TDD		
RMC CORESET Reference Channel		CCR.3.1 TDD			CCR.3.1 TDD		
OCNG Patterns		OP.1					
SMTC configuration		SMTC.1					
SSB configuration		SSB.1 FR2					
TCI state		TBD					
TRS configuration		TBD					
EPRE ratio of PSS to SSS	dB	0					
EPRE ratio of PBCH_DMRS to SSS							
EPRE ratio of PBCH to PBCH_DMRS							
EPRE ratio of PDCCH_DMRS to SSS							
EPRE ratio of PDCCH to PDCCH_DMRS							
EPRE ratio of PDSCH_DMRS to SSS							
EPRE ratio of PDSCH to PDSCH_DMRS							
EPRE ratio of OCNG DMRS to SSS [note 1]							
EPRE ratio of OCNG to OCNG DMRS [note 1]							
$\hat{E}_s/N_{oc}$	dB	TBD+TT					
Propagation conditions		AWGN					

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

Table 5.5.3.1.5-2: OTA related test parameters for FR2 SCell activation case

Parameter note 6		Unit	Cell 2			Cell 3		
			T1	T2	T3	T1	T2	T3
Angle of arrival configuration			According to table A.X.X			According to table A.X.X		
N_{oc} note1	NR_TDD_FR2_A	dBm/15kHz note4	TBD+TT			TBD+TT		
	NR_TDD_FR2_B							
	NR_TDD_FR2_F							
	NR_TDD_FR2_G							
	NR_TDD_FR2_T							
	NR_TDD_FR2_Y							
N_{oc} note1	NR_TDD_FR2_A	dBm/SCS note3	TBD+TT			TBD+TT		
	NR_TDD_FR2_B							
	NR_TDD_FR2_F							
	NR_TDD_FR2_G							
	NR_TDD_FR2_T							
	NR_TDD_FR2_Y							
SS-RSRP note2	NR_TDD_FR2_A	dBm/SCS note4	TBD+TT			TBD+TT		
	NR_TDD_FR2_B							
	NR_TDD_FR2_F							
	NR_TDD_FR2_G							
	NR_TDD_FR2_T							
	NR_TDD_FR2_Y							
$\hat{E}_s/I_{ot}$		dB	TBD+TT			TBD+TT		
Io note2	NR_TDD_FR2_A	dBm/95.04 MHz note4	TBD +TT			TBD+TT		
	NR_TDD_FR2_B							
	NR_TDD_FR2_F							
	NR_TDD_FR2_G							
	NR_TDD_FR2_T							
	NR_TDD_FR2_Y							

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.
NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone.
NOTE 6: All parameters apply for configuration 1 and 2.

During T2 the UE shall send the first CSI report for SCell in a slot (m+k), or in a slot (m+1+[T_{HARQ}+3ms+T_{SSB_max}+$T_{SMTC\_duration}$]+1) as defined in TS 38.133 [6] section 8.3 if the slot (m+k) was subject to interruption. Whether CSI report in slot (m+k) was interrupted or not is checked by monitoring ACK/NACK sent in PCell in slot (m+k).

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot (m+T_{HARQ}+$T_{activation\_time}$+$T_{CSI\_Reporting}$), $T_{activation\_time}$ = [3ms+TBD], as defined in TS 38.133 [6] section 8.3.

During T3 the UE shall stop sending CSI reports for SCell at latest in a slot (n+[T_{HARQ}+3ms]), as defined in TS 38.133 [6] section 8.3.

During T2 interruption of PCell / PSCell during SCell activation shall not happen outside the slot (m+1+[T_{HARQ}]) to (m+1+[T_{HARQ}+3ms+T_{SSB_max}+$T_{SMTC\_duration}$]), as defined in TS 38.133 [6] section 8.3.

During T3 interruption of PCell / PSCell during SCell deactivation shall not happen outside the slot (n+1+[T_{HARQ}]) to (n+1+[T_{HARQ}+3ms]), as defined in TS 38.133 [6] section 8.3.

The interruption of PSCell shall not be more than the values specified for EN-DC in TS 38.133 [6] section 8.2.1.2.4.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot ($m+T_{HARQ}+T_{activation\_time}+T_{CSI\_Reporting}$) as defined in TS 38.133 [6] section 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

5.5.4 UE UL carrier RRC reconfiguration delay

5.5.5 Link recovery procedures

5.5.6 Active BWP switch delay

5.5.6.1 DCI-based and time-based active BWP switch

5.5.6.1.0 Minimum conformance requirements

FFS

5.5.6.1.1 EN-DC FR2 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

5.5.6.1.1.1 Test purpose

FFS

5.5.6.1.1.2 Test applicability

FFS

5.5.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.6.1.1.

5.5.6.1.1.4 Test description

5.5.6.1.1.4.1 Initial conditions

FFS

5.5.6.1.1.4.2 Test procedure

FFS

5.5.6.1.1.4.3 Message contents

FFS

5.5.6.1.1.5 Test requirements

FFS

5.5.6.1.2 EN-DC FR2 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

5.5.6.1.2.1 Test purpose

FFS

5.5.6.1.2.2 Test applicability

FFS

5.5.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.6.1.2.

5.5.6.1.2.4 Test description

5.5.6.1.2.4.1 Initial conditions

FFS

5.5.6.1.2.4.2 Test procedure

FFS

5.5.6.1.2.4.3 Message contents

FFS

5.5.6.1.2.5 Test requirements

FFS

5.5.6.2 RRC-based active BWP switch

5.5.6.2.0 Minimum conformance requirements

FFS

5.5.6.2.1 EN-DC FR2 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

5.5.6.2.1.1 Test purpose

FFS

5.5.6.2.1.2 Test applicability

FFS

5.5.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.6.2.1.

5.5.6.2.1.4 Test description

5.5.6.2.1.4.1 Initial conditions

FFS

5.5.6.2.1.4.2 Test procedure

FFS

5.5.6.2.1.4.3 Message contents

FFS

5.5.6.2.1.5 Test requirements

FFS

5.6 Measurement procedures

5.6.1 Intra-frequency measurements

5.6.2 Inter-frequency measurements

5.6.2.0 Minimum conformance requirements for Inter-frequency measurements

[TS 38.133-f40, clause 9.3.2]

The requirements in Section 9.3 apply, provided:

- The cell being identified or measured is detectable.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in Sections 10.1.4 and 10.1.5 for FR1 and FR2, respectively, for a corresponding Band,

- SS-RSRQ related side conditions given in Sections 10.1.9 and 10.1.10 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in Sections 10.1.14 and 10.1.15 for FR1 and FR2, respectively, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to Annex B.2.3 for a corresponding Band.

[TS 38.133-f40, clause 9.3.4]

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter frequency cell within $T_{identify\_inter\_without\_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within $T_{identify\_inter\_with\_index}$. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within $T_{identify\_inter\_without\_index}$.

$$T_{identify\_inter\_without\_index} = (T_{PSS/SSS\_sync\_inter} + T_{SSB\_measurement\_period\_inter})\ ms$$

$$T_{identify\_inter\_with\_index} = (T_{PSS/SSS\_sync\_inter} + T_{SSB\_measurement\_period\_inter} + T_{SSB\_time\_index\_inter})\ ms$$

Where:

T_{PSS/SSS_sync_inter}: it is the time period used in PSS/SSS detection given in table 9.3.4-1 and table 9.3.4-2.

$T_{SSB\_time\_index\_inter}$: it is the time period used to acquire the index of the SSB being measured given in table 9.3.4-3 and table 9.3.4-4.

$T_{SSB\_measurement\_period\_inter}$: equal to a measurement period of SSB based measurement given in table 9.3.5-1 and table 9.3.5-2.

M_{pss/sss_sync_inter} : For a UE supporting FR2 power class 1, M_{pss/sss_sync_inter}=64 samples. For a UE supporting FR2 power class 2 (vehicle mounted), M_{pss/sss_sync_inter}=40 samples. For a UE supporting FR2 power class 3 (handheld), M_{pss/sss_sync_inter}=40 samples. For a UE supporting FR2 power class 4, M_{pss/sss_sync}=[40] samples.

$M_{SSB\_index\_inter}$: For a UE supporting power class 1, $M_{SSB\_index\_inter}$ =[40] samples. For a vehicle mounted UE supporting power class 2 (vehicle mounted), M_{pss/sss_sync_inter}=[24] samples.For a UE supporting power class 3 (handheld), $M_{SSB\_index\_inter}$ =[24] samples. For a UE supporting power class 4, $M_{meas\_period\_inter}$ =[TBD] samples.

$M_{meas\_period\_inter}$: For a UE supporting FR2 power class 1, $M_{meas\_period\_inter}$ =64 samples. For a vehicle mounted UE supporting FR2 power class 2 (vehicle mounted), M_{pss/sss_sync_inter}=40 samples.For a UE supporting FR2 power class 3 (handheld), $M_{meas\_period\_inter}$ =40 samples. For a UE supporting FR2 power class 4, $M_{meas\_period\_inter}$ =[40] samples.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within\_gap,i}$ in section 9.1.5.2 for measurement conducted within measurement gaps.

Table 9.3.4-2: Time period for PSS/SSS detection, (Frequency range FR2)

Condition NOTE1,2	T_{PSS/SSS_sync_inter}
No DRX	max[600ms, M_{pss/sss_sync_inter} x max(MGRP, SMTC period)] x $CSSF_{inter}$
DRX cycle ≤ 320ms	max[600ms, (1.5 x M_{pss/sss_sync_inter}) x max(MGRP, SMTC period, DRX cycle)] x $CSSF_{inter}$
DRX cycle > 320ms	M_{pss/sss_sync_inter} x DRX cycle x $CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

Table 9.3.4-4: Time period for time index detection (Frequency range FR2)

Condition NOTE1,2	$T_{SSB\_time\_index\_inter}$
No DRX	max[200ms, $M_{SSB\_index\_inter}$ x max(MGRP, SMTC period)] x $CSSF_{inter}$
DRX cycle ≤ 320ms	max[200ms, (1.5 x $M_{SSB\_index\_inter}$) x max(MGRP, SMTC period, DRX cycle)] x $CSSF_{inter}$
DRX cycle > 320ms	$M_{SSB\_index\_inter}$ x DRX cycle x $CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

[TS 38.133-f40, clause 9.3.5]

When measurement gaps are provided for inter frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in sub-clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 9.3.5-1 and 9.3.5-2:

Table 9.3.5-2: Measurement period for inter-frequency measurements with gaps (Frequency FR2)

Condition NOTE1,2	$T_{SSB\_measurement\_period\_inter}$
No DRX	max[400ms, $M_{meas\_period\_inter}$ x max(MGRP, SMTC period)] x $CSSF_{inter}$
DRX cycle ≤ 320ms	max[400ms, (1.5 x $M_{meas\_period\_inter}$) x max(MGRP, SMTC period, DRX cycle)] x $CSSF_{inter}$
DRX cycle > 320ms	$M_{meas\_period\_inter}$ x DRX cycle x $CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

[TS 38.133-f40, clause 9.3.6.3]

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered measurement reports shall meet the requirements in sections 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be within $T_{identify\_inter\_without\_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index. Otherwise UE shall be able to identify a new detectable inter frequency cell within $T_{identify\_inter\_with\_index}$. Both $T_{identify\_inter\_without\_index}$ and $T_{identify\_inter\_with\_index}$ are defined in clause 9.3.4. When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{identify\_inter\_without\_index}$ or $T_{identify\_inter\_with\_index}$ defined in clause 9.3.4 and then triggers the measurement report as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than $T_{SSB\_measurement\_period\_inter}$ defined in clause 9.3.5 provided the timing to that cell has not changed more than ± 3200 Tc while measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clause 9.3.2, 9.3.4, 9.3.5, 9.3.6.3.

5.6.2.1 EN-DC FR2-FR2 event-triggered reporting in non-DRX

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

-The Test tolerances and Test system uncertainties applicable to this test are undefined.

-Cell Configuration table in Annex A is undefined.

-Antenna diagram is TBD

-Message content is TBD

-Test case applicability in 38.522 Table 4.2-2 is TBD

- Minimum conformance requirements contain TBDs
- Test requirement contain TBDs
- Initial conditions contain TBDs

5.6.2.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

5.6.2.1.2 Test applicability

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

5.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.1.

5.6.2.1.4 Test description

5.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.1.4.1-1.

Table 5.6.2.1.4.1-1: EN-DC FR2-FR2 event triggered reporting tests in non-DRX supported test configurations

Test Case ID	Description
5.6.2.1-1	LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.2.1-2	LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 5.6.2.1.4-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Number		Config 1,2	1		One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2	1, 2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2	LTE Cell 1 (PCell) and NR cell 2 (PScell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2	NR cell 3		NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2	0	13	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2	39	39	
SMTC-SSB parameters		Config 1,2	SSB.1 FR2		As specified in clause A.3.10.2
A3-Offset	dB	Config 1,2	-6		
Hysteresis	dB	Config 1,2	0		
CP length		Config 1,2	Normal		
TimeToTrigger	s	Config 1,2	0		
Filter coefficient		Config 1,2	0		L3 filtering is not used
DRX		Config 1,2	OFF		DRX is not used
Time offset between PCell and PSCell		Config 1,2	3 µs		Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,2	3µs		Synchronous cells.
T1	s	Config 1,2	5		
T2	s	Config 1,2	TBD	TBD	

Table 5.6.2.1.4.1-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 5.6.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	TBD		

1. Message contents are defined in clause 5.6.2.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex C.1.2.

5.6.2.1.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. . The TCI status for cell2 is defined in table [TBD] and TRS configuration for cell2 is defined in table [TBD].

In test 1 measurement gap pattern configuration # 0 as defined in Table 5.6.2.1.4.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 5.6.2.1.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

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

2. Set the parameters according to T1 in Table 5.6.2.1.4.1-2.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.1.4.1-2.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 5.6.2.1.4.1-2 as appropriate.

TBD5.6.2.1.4.3 Message contents

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

TBD

5.6.2.1.5 Test requirement

Table 5.6.2.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.2.1.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
NR RF Channel Number		Config 1,2	1		2	
Duplex mode		Config 1,2	TDD		TDD	
$BW_{channel}$	MHz	Config 1,2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP BW	MHz	Config 1,2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
TDD configuration		Config 1,2	TDDConf.3.1		TDDConf.3.1	
Initial DL BWP		Config 1,2	DLBWP.0.1		NA	
Dedicated DL BWP		Config 1,2	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2	ULBWP.1.1		NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,2	SR.3.1 TDD		-	
CORESET Reference Channel		Config 1,2	CR.3.1 TDD		-	
SMTC configuration defined in A.3.11.1 and A.3.11. 2		Config 1,2	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	120		120	
EPRE ratio of PSS to SSS		Config 1,2	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
UE orientation around TBD axis and TBD axis	degrees	Config 1,2	NA		TBD	
Relative difference in angle of arrival of cell 3 relative to cell 2	degrees	Config 1,2	NA		NA	TBD
N_{oc} Note2	dBm/15 kHz Note5		TBD		TBD	
N_{oc} Note2	dBm/SCS Note4	Config 1,2	TBD		TBD	
SS-RSRP Note 3	dBm/SCS Note5	Config 1,2	TBD	TBD	TBD	TBD
$\hat{E}_s/I_{ot}$	dB	Config 1,2	TBD	TBD	TBD	TBD
$\hat{E}_s/N_{oc}$	dB	Config 1,2	TBD	TBD	TBD	TBD
Io Note3	dBm/95.04 MHz Note5	Config 1,2	TBD	TBD	TBD	TBD
Propagation Condition		Config 1,2	AWGN			

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5:	Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6:	As observed with 0dBi gain antenna at the centre of the quiet zone

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

5.6.2.2 EN-DC FR2-FR2 event-triggered reporting in DRX

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

-The Test tolerances and Test system uncertainties applicable to this test are undefined.

-Cell Configuration table in Annex A is undefined.

-Antenna diagram is TBD

-Message content is TBD

-Test case applicability in 38.522 Table 4.2-2 is TBD

- Minimum conformance requirements containTBDs
- Test requirement contain TBDs
- Initial conditions contain TBDs

5.6.2.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

5.6.2.2.2 Test applicability

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

5.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.2.

5.6.2.2.4 Test description

5.6.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.2.4.1-1.

Table 5.6.2.2.4.1-1: EN-DC FR2-FR2 event triggered reporting tests in DRX supported test configurations

Test Case ID	Description
5.6.2.2-1	LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.2.2-2	LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 5.6.2.2.4-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Number		Config 1,2	1				One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2	1, 2				Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2	LTE Cell 1 (PCell) and NR cell 2 (PScell)				LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2	NR cell 3				NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2	0		13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2	39		39		
SMTC-SSB parameters		Config 1,2	SSB.1 FR2				As specified in clause A.3.10.2
A3-Offset	dB	Config 1,2	-6				
Hysteresis	dB	Config 1,2	0				
CP length		Config 1,2	Normal				
TimeToTrigger	s	Config 1,2	0				
Filter coefficient		Config 1,2	0				L3 filtering is not used
DRX		Config 1,2	DRX.1	DRX.2	DRX.1	DRX.2	DRX is not used
Time offset between PCell and PSCell		Config 1,2	3 µs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,2	3µs				Synchronous cells.
T1	s	Config 1,2	5				
T2	s	Config 1,2	TBD	TBD	TBD	TBD	

Table 5.6.2.2.4.1-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in non-DRX

<table>
<tr><th>Parameter</th><th colspan="2">Value</th><th>Comment</th></tr>
<tr><td>Test environment</td><td colspan="2">NC</td><td>As specified in TS 38.508-1 [14] clause 4.1.</td></tr>
<tr><td>Test frequencies</td><td colspan="3">As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.</td></tr>
<tr><td>Channel bandwidth</td><td colspan="3">As specified by the test configuration selected from Table 5.6.2.2.4.1-1.</td></tr>
<tr><td>Propagation conditions</td><td colspan="2">AWGN</td><td>As specified in Annex C.2.2.</td></tr>
<tr><td rowspan="2">Connection Diagram</td><td>TE Part</td><td>TBD</td><td rowspan="2">As specified in TS 38.508-1 [14] Annex A.</td></tr>
<tr><td>DUT Part</td><td>TBD</td></tr>
<tr><td>Exceptions to connection diagram</td><td colspan="2">TBD</td><td></td></tr>
</table>

1. Message contents are defined in clause 5.6.2.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex C.1.2.

5.6.2.2.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The TCI status for cell2 is defined in table [TBD] and TRS configuration for cell2 is defined in table [TBD].

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 5.6.2.2.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 5.6.2.2.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

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

2. Set the parameters according to T1 in Table 5.6.2.2.4.1-2.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.2.4.1-2.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 5.6.2.2.4.1-2 as appropriate.

TBD5.6.2.2.4.3 Message contents

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

TBD

5.6.2.2.5 Test requirement

Table 5.6.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Table A.5.6.2.2.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
NR RF Channel Number		Config 1,2	1		2	
Duplex mode		Config 1,2	TDD		TDD	
$BW_{channel}$	MHz	Config 1,2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP BW	MHz	Config 1,2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
TDD configuration		Config 1,2	TDDConf.3.1		TDDConf.3.1	
Initial DL BWP		Config 1,2	DLBWP.0.1		NA	
Dedicated DL BWP		Config 1,2	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2	ULBWP.1.1		NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,2	SR.3.1 TDD		-	
CORESET Reference Channel		Config 1,2	CR.3.1 TDD		-	
SMTC configuration defined in A.3.11.1 and A.3.11. 2		Config 1,2	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	120		120	
EPRE ratio of PSS to SSS		Config 1,2	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
UE orientation around TBD axis and TBD axis	degrees	Config 1,2	NA		TBD	
Relative difference in angle of arrival of cell 3 relative to cell 2	degrees	Config 1,2	NA		NA	TBD
N_{oc} Note2	dBm/15 kHz Note5		TBD		TBD	
N_{oc} Note2	dBm/SCS Note4	Config 1,2	TBD		TBD	
SS-RSRP Note 3	dBm/SCS Note5	Config 1,2	TBD	TBD	TBD	TBD
$\hat{E}_s/I_{ot}$	dB	Config 1,2	TBD	TBD	TBD	TBD
$\hat{E}_s/N_{oc}$	dB	Config 1,2	TBD	TBD	TBD	TBD
Io Note3	dBm/95.04 MHz Note5	Config 1,2	TBD	TBD	TBD	TBD
Propagation Condition		Config 1,2	AWGN			

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5:	Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6:	As observed with 0dBi gain antenna at the centre of the quiet zone

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2 , 3 and 4 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

5.6.2.3 EN-DC FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

-The Test tolerances and Test system uncertainties applicable to this test are undefined.

-Cell Configuration table in Annex A is undefined.

-Antenna diagram is TBD

-Message content is TBD

-Test case applicability in 38.522 Table 4.2-2 is TBD

- Minimum conformance requirements containTBDs
- Test requirement contains TBDs
- Initial conditions contain TBDs

5.6.2.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

5.6.2.3.2 Test applicability

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

5.6.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.3.

5.6.2.3.4 Test description

5.6.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.3.4.1-1.

Table 5.6.2.3.4.1-1: EN-DC FR2-FR2 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations

Test Case ID	Description
5.6.2.3-1	LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.2.3-2	LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 5.6.2.3.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Number		Config 1,2	1		One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2	1, 2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2	LTE Cell 1 (PCell) and NR cell 2 (PScell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2	NR cell 3		NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2	0	13	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2	39	39	
SMTC-SSB parameters		Config 1,2	SSB.1 FR2		As specified in clause A.3.10.2
A3-Offset	dB	Config 1,2	-6		
Hysteresis	dB	Config 1,2	0		
CP length		Config 1,2	Normal		
TimeToTrigger	s	Config 1,2	0		
Filter coefficient		Config 1,2	0		L3 filtering is not used
DRX		Config 1,2	OFF		DRX is not used
Time offset between PCell and PSCell		Config 1,2	3 µs		Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,2	3µs		Synchronous cells.
T1	s	Config 1,2	5		
T2	s	Config 1,2	TBD	TBD	

Table 5.6.2.3.4.1-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 5.6.2.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	TBD		

1. Message contents are defined in clause 5.6.2.3.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex C.1.2.

5.6.2.3.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The TCI status for cell2 is defined in table [TBD] and TRS configuration for cell2 is defined in table [TBD].

In test 1 measurement gap pattern configuration # 0 as defined in Table 5.6.2.3.4.1-1 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 5.6.2.3.4.1-1 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

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

2. Set the parameters according to T1 in Table 5.6.2.3.4.1-2.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.3.4.1-2.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 5.6.2.3.4.1-2 as appropriate.

TBD5.6.2.3.4.3 Message contents

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

TBD

5.6.2.3.5 Test requirement

Table 5.6.2.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.2.3.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
NR RF Channel Number		Config 1,2	1		2	
Duplex mode		Config 1,2	TDD		TDD	
$BW_{channel}$	MHz	Config 1,2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP BW	MHz	Config 1,2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
TDD configuration		Config 1,2	TDDConf.3.1		TDDConf.3.1	
Initial DL BWP		Config 1,2	DLBWP.0.1		NA	
Dedicated DL BWP		Config 1,2	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2	ULBWP.1.1		NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,2	SR.3.1 TDD		-	
CORESET Reference Channel		Config 1,2	CR.3.1 TDD		-	
SMTC configuration defined in A.3.11.1 and A.3.11. 2		Config 1,2	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	120		120	
EPRE ratio of PSS to SSS		Config 1,2	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
UE orientation around TBD axis and TBD axis	degrees	Config 1,2	NA		TBD	
Relative difference in angle of arrival of cell 3 relative to cell 2	degrees	Config 1,2	NA		NA	TBD
N_{oc} Note2	dBm/15 kHz Note5		TBD		TBD	
N_{oc} Note2	dBm/SCS Note4	Config 1,2	TBD		TBD	
SS-RSRP Note 3	dBm/SCS Note5	Config 1,2	TBD	TBD	TBD	TBD
$\hat{E}_s/I_{ot}$	dB	Config 1,2	TBD	TBD	TBD	TBD
$\hat{E}_s/N_{oc}$	dB	Config 1,2	TBD	TBD	TBD	TBD
Io Note3	dBm/95.04 MHz Note5	Config 1,2	TBD	TBD	TBD	TBD
Propagation Condition		Config 1,2	AWGN			

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5:	Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6:	As observed with 0dBi gain antenna at the centre of the quiet zone

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI$_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

5.6.2.4 EN-DC FR2-FR2 event-triggered reporting in DRX with SSB time index detection

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

-The Test tolerances and Test system uncertainties applicable to this test are undefined.

-Cell Configuration table in Annex A is undefined.

-Antenna diagram is TBD

-Message content is TBD

-Test case applicability in 38.522 Table 4.2-2 is TBD

- Minimum conformance requirements contain TBDs
- Test requirement contains TBDs
- Initial conditions contain TBDs

5.6.2.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

5.6.2.4.2 Test applicability

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

5.6.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.4.

5.6.2.4.4 Test description

5.6.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.4.4.1-1.

Table 5.6.2.4.4.1-1: EN-DC FR2-FR2 event triggered reporting tests in DRX with SSB time index detection supported test configurations

Test Case ID	Description
5.6.2.4-1	LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.2.4-2	LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 5.6.2.4.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Number		Config 1,2	1				One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2	1, 2				Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2	LTE Cell 1 (PCell) and NR cell 2 (PScell)				LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2	NR cell 3				NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2	0		13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2	39		39		
SMTC-SSB parameters		Config 1,2	SSB.1 FR2				As specified in clause A.3.10.2
A3-Offset	dB	Config 1,2	-6				
Hysteresis	dB	Config 1,2	0				
CP length		Config 1,2	Normal				
TimeToTrigger	s	Config 1,2	0				
Filter coefficient		Config 1,2	0				L3 filtering is not used
DRX		Config 1,2	DRX.1	DRX.2	DRX.1	DRX.2	DRX is not used
Time offset between PCell and PSCell		Config 1,2	3 μs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,2	3μs				Synchronous cells.
T1	s	Config 1,2	5				
T2	s	Config 1,2	TBD	TBD	TBD	TBD	

Table 5.6.2.4.4.1-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 5.6.2.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	TBD		

1. Message contents are defined in clause 5.6.2.4.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex C.1.2.

5.6.2.4.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The TCI status for cell2 is defined in table [TBD] and TRS configuration for cell2 is defined in table [TBD].In test 1&2 measurement gap pattern configuration # 0 as defined in Table 5.6.2.4.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 5.6.2.4.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 5.6.2.4.4.1-2.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit RRCConnectionReconfigurationComplete message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.4.4.1-2.
6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 5.6.2.4.4.1-2 as appropriate.

TBD5.6.2.4.4.3 Message contents

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

TBD

5.6.2.4.5 Test requirement

Table 5.6.2.4.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.2.4.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
NR RF Channel Number		Config 1,2	1		2	
Duplex mode		Config 1,2	TDD		TDD	
$BW_{channel}$	MHz	Config 1,2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP BW	MHz	Config 1,2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
TDD configuration		Config 1,2	TDDConf.3.1		TDDConf.3.1	
Initial DL BWP		Config 1,2	DLBWP.0.1		NA	
Dedicated DL BWP		Config 1,2	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2	ULBWP.1.1		NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,2	SR.3.1 TDD		-	
CORESET Reference Channel		Config 1,2	CR.3.1 TDD		-	
SMTC configuration defined in A.3.11.1 and A.3.11. 2		Config 1,2	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	120		120	
EPRE ratio of PSS to SSS		Config 1,2	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
UE orientation around TBD axis and TBD axis	degrees	Config 1,2	NA		TBD	
Relative difference in angle of arrival of cell 3 relative to cell 2	degrees	Config 1,2	NA		NA	TBD
N_{oc} Note2	dBm/15 kHz Note5		TBD		TBD	
N_{oc} Note2	dBm/SCS Note4	Config 1,2	TBD		TBD	
SS-RSRP Note 3	dBm/SCS Note5	Config 1,2	TBD	TBD	TBD	TBD
$\hat{E}_s/I_{ot}$	dB	Config 1,2	TBD	TBD	TBD	TBD
$\hat{E}_s/N_{oc}$	dB	Config 1,2	TBD	TBD	TBD	TBD
Io Note3	dBm/95.04 MHz Note5	Config 1,2	TBD	TBD	TBD	TBD
Propagation Condition		Config 1,2	AWGN			

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5:	Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6:	As observed with 0dBi gain antenna at the centre of the quiet zone

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2 , 3 and 4 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

5.6.2.5 EN-DC FR1-FR2 event-triggered reporting in non-DRX

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.
- Cell Configuration table in Annex E is undefined.
- Antenna diagram is TBD
- Message content is TBD
- Test case applicability is TBD
- Minimum conformance requirements are TBD
- Test requirement is TBD
- Initial conditions contain TBDs
- TC will be moved to FR2 section 5.6.2

5.6.2.5.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

5.6.2.5.2 Test applicability

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

5.6.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause TBD

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.5.

5.6.2.5.4 Test description

5.6.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.5.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.2.5.4.1-2. Test environment parameters are given in Table 5.6.2.5.4.1-3.

Table 5.6.2.5.4.1-1 EN-DC FR1-FR2 event triggered reporting tests in non-DRX supported test configurations

Test Case ID	Description of serving cell	Description of target cell
5.6.2.5-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.2.5-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
5.6.2.5-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
5.6.2.5-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	
5.6.2.5-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
5.6.2.5-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2		

Table 5.6.2.5.4-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1		One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3		NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0	13	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39	39	
SMTC-SSB parameters on NR RF Channel 1		Config 1,4	SSB.1 FR1		As specified in clause A.3.10.1
		Config 2,5	SSB.1 FR1		As specified in clause A.3.10.1
		Config 3,6	SSB.2 FR1		As specified in clause A.3.10.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3,4,5,6	SSB.1 FR2		As specified in clause A.3.10.2
offsetMO	dB	Config 1,2,3,4,5,6	6		
Hysteresis	dB	Config 1,2,3,4,5,6	0		
a4-Threshold	dBm	Config 1,2,3,4,5,6	TBD		
CP length		Config 1,2,3,4,5,6	Normal		
TimeToTrigger	s	Config 1,2,3,4,5,6	0		
Filter coefficient		Config 1,2,3,4,5,6	0		L3 filtering is not used
DRX		Config 1,2,3,4,5,6	OFF		DRX is not used
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 µs		Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3µs		Synchronous cells.
T1	s	Config 1,2,3,4,5,6	5		
T2	s	Config 1,2,3,4,5,6	TBD	TBD	

Table 4.6.2.4.4-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table TBD and TS 38.508-1 [14] clause TBD	

Channel bandwidth	As specified by the test configuration selected from Table 5.6.2.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	TBD		

1. Message contents are defined in clause 5.6.2.5.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR2 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex TBD

5.6.2.5.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 5.6.2.5.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 5.6.2.5.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 5.6.2.5.4.1-2.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit RRCConnectionReconfigurationComplete message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.5.4.1-2.
6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.
7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]
9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters

Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
or:
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 4.6.2.1.4.1-2 as appropriate.

TBD5.6.2.5.4.3 Message contents

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

Table 5.6.2.5.4.3-1: Common Exception messages for Additional EN-DC FR1-FR2 event triggered reporting tests without SSB time index detection in non-DRX test requirement

Default Message Contents	
Common contents of system information blocks exceptions	Table H. TBD
Default RRC messages and information elements contents exceptions	Table H. TBD

TBD

5.6.2.5.5 Test requirement

Table 5.6.2.5.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.2.5.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Cell 2 T1	Cell 2 T2	Cell 3 T1	Cell 3 T2
NR RF Channel Number		Config 1,2,3,4,5,6	1		2	
Duplex mode		Config 1,4	FDD		TDD	
		Config 2,3,5,6	TDD		TDD	
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 2,5	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 3,6	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP BW	MHz	Config 1,4	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 2,5	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 3,6	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
TDD configuration		Config 2,5	TDDConf.1.1		TDDConf.3.1	
		Config 3,6	TDDConf.2.1		TDDConf.3.1	
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1		NA	
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1		NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2,3,4,5,6	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,4	SR.1.1 FDD		-	
		Config 2,5	SR.1.1 TDD			
		Config 3,6	SR2.1 TDD			
CORESET Reference Channel		Config 1,4	CR.1.1 FDD		-	
		Config 2,5	CR.1.1 TDD			
		Config 3,6	CR2.1 TDD			
SMTC configuration defined in A.3.11.1 and A.3.11.2		Config 1,4	SMTC.2		SMTC.2	
		Config 2,3,5,6	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15		120	
		Config 3,6	30		120	
EPRE ratio of PSS to SSS		Config 1,2,3,4,5,6	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
UE orientation around TBD axis and TBD axis	degrees	Config 1,2,3,4,5,6	NA		TBD	
Relative difference in angle of arrival of cell 3 relative to cell 2	degrees	Config 1,2,3,4,5,6	NA		NA	TBD
N_{oc} Note2	dBm/15 kHz Note5		NA		TBD	

N_{oc} Note2	dBm/SCS Note4	Config 1,2,4,5	NA		TBD	
		Config 3,6	NA		TBD	
SS-RSRP Note 3	dBm/SCS Note5	Config 1,2,4,5	NA	NA	-Infinity	TBD
		Config 3,6	NA	NA	-Infinity	TBD
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3,4,5,6	NA	NA	-Infinity	TBD
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6	NA	NA	-Infinity	TBD
Io Note3	dBm/9.36MHz	Config 1,2,4,5	NA	NA	-	-
	dBm/38.16MHz	Config 3,6	NA	NA	-	-
	dBm/95.04 MHz Note5	Config 1,2,3,4,5,6	-	-	-Infinity	TBD
Propagation Condition		Config 1,2,3,4,5,6	AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone

In test 1 with per-UE gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

5.6.2.6 EN-DC FR1-FR2 event-triggered reporting in DRX

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.
- Cell Configuration table in Annex E is undefined.
- Antenna diagram is TBD
- Message content is TBD
- Test case applicability is TBD
- Minimum conformance requirements are TBD
- Test requirement is TBD

- Initial conditions contain TBD
- TC will be moved to FR2 section 5.6.2

5.6.2.6.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX within inter-frequency cell search requirements.

5.6.2.6.2 Test applicability

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

5.6.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause TBD

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.6.

5.6.2.6.4 Test description

5.6.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.6.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.2.6.4.1-2. Test environment parameters are given in Table 5.6.2.6.4.1-3.

Table 5.6.2.6.4.1-1: EN-DC FR1-FR2 event triggered reporting tests in DRX supported test configurations

Test Case ID	Description of serving cell	Description of target cell
5.6.2.6-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.2.6-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
5.6.2.6-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
5.6.2.6-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	
5.6.2.6-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
5.6.2.6-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2		

Table 5.6.2.6.4-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1				One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2				Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)				LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3				NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0		13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39		39		
SMTC-SSB parameters on NR RF Channel 1		Config 1,4	SSB.1 FR1				As specified in clause A.3.10.1
		Config 2,5	SSB.1 FR1				As specified in clause A.3.10.1
		Config 3,6	SSB.2 FR1				As specified in clause A.3.10.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3,4,5,6	SSB.1 FR2				As specified in clause A.3.10.2
offsetMO	dB	Config 1,2,3,4,5,6	6				
Hysteresis	dB	Config 1,2,3,4,5,6	0				
a4-Threshold	dBm	Config 1,2,3,4,5,6	TBD				
CP length		Config 1,2,3,4,5,6	Normal				
TimeToTrigger	s	Config 1,2,3,4,5,6	0				
Filter coefficient		Config 1,2,3,4,5,6	0				L3 filtering is not used
DRX		Config 1,2,3,4,5,6	DRX.1	DRX.2	DRX.1	DRX.2	DRX is used
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 µs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms				Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3µs				Synchronous cells.
T1	s	Config 1,2,3,4,5,6	5				
T2	s	Config 1,2,3,4,5,6	TBD	TBD	TBD	TBD	

Table 5.6.2.6.4-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table TBD and TS 38.508-1 [14] clause TBD	

Channel bandwidth	As specified by the test configuration selected from Table 4.6.2.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	TBD		

1. Message contents are defined in clause 4.6.2.3.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR2 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex TBD

5.6.2.6.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 5.6.2.6.4-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 5.6.2.6.4-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.6.1.1-1.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 5.6.2.6.4-2 .
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit RRCConnectionReconfigurationComplete message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.6.4-2 .
6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.
7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]
9. After the RRC connection release, the SS:

- transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
or:
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 5.6.2.6.4-2 as appropriate.

TBD5.6.2.6.4.3 Message contents

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

Table 5.6.2.6.4.3-1: Common Exception messages for Additional EN-DC FR1-FR2 event triggered reporting tests without SSB time index detection in DRX test requirement

Default Message Contents	
Common contents of system information blocks exceptions	Table H. TBD
Default RRC messages and information elements contents exceptions	Table H. TBD

5.6.2.6.5 Test requirement

Table 5.6.2.6.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.2.6.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
NR RF Channel Number		Config 1,2,3,4,5,6	1		2	
Duplex mode		Config 1,4	FDD		TDD	
		Config 2,3,5,6	TDD		TDD	
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 2,5	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 3,6	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP BW	MHz	Config 1,4	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 2,5	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 3,6	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
TDD configuration		Config 2,5	TDDConf.1.1		TDDConf.3.1	
		Config 3,6	TDDConf.2.1		TDDConf.3.1	
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1		NA	
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1		NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2,3,4,5,6	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,4	SR.1.1 FDD		-	
		Config 2,5	SR.1.1 TDD			
		Config 3,6	SR2.1 TDD			
CORESET Reference Channel		Config 1,4	CR.1.1 FDD		-	
		Config 2,5	CR.1.1 TDD			
		Config 3,6	CR2.1 TDD			
SMTC configuration defined in A.3.11.1 and A.3.11.2		Config 1,4	SMTC.2		SMTC.2	
		Config 2,3,5,6	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15		120	
		Config 3,6	30		120	
EPRE ratio of PSS to SSS		Config 1,2,3,4,5,6	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
UE orientation around TBD axis and TBD axis	degrees	Config 1,2,3,4,5,6	NA		TBD	
Relative difference in angle of arrival of cell 3 relative to cell 2	degrees	Config 1,2,3,4,5,6	NA		NA	TBD
N_{oc} Note2	dBm/15 kHz Note5		NA		TBD	

N_{oc} Note2	dBm/SCS Note4	Config 1,2,4,5	NA		TBD	
		Config 3,6	NA		TBD	
SS-RSRP Note 3	dBm/SCS Note5	Config 1,2,4,5	NA	NA	TBD	TBD
		Config 3,6	NA	NA	TBD	TBD
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3,4,5,6	NA	NA	TBD	TBD
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6	NA	NA	TBD	TBD
Io Note3	dBm/9.36MHz	Config 1,2,4,5	NA	NA	-	-
	dBm/38.16MHz	Config 3,6	NA	NA	-	-
	dBm/95.04 MHz Note5	Config 1,2,3,4,5,6	-	-	TBD	TBD
Propagation Condition		Config 1,2,3,4,5,6	AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone

In test 1 with per-UE gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2 , 3 and 4 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

5.6.2.7 EN-DC FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.

- Cell Configuration table in Annex E is undefined.
- Antenna diagram is TBD
- Message content is TBD
- Minimum conformance requirements are TBD
- Test requirement is TBD
- Initial conditions contains TBDs
- TC will be moved to FR2 section 5.6.2

5.6.2.7.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements with SSB time index detection.

5.6.2.7.2 Test applicability

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

TBD

5.6.2.7.3 Minimum conformance requirements

TBD

5.6.2.7.4 Test description

5.6.2.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.7.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.2.7.4.1-2. Test environment parameters are given in Table 5.6.2.7.4.1-3.

Table 5.6.2.7.4.1-1: EN-DC FR1-FR2 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations

Test Case ID	Description of serving cell	Description of target cell
5.6.2.7-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.2.7-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
5.6.2.7-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
5.6.2.7-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	
5.6.2.7-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
5.6.2.7-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2		

Table 5.6.2.7.4-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1		One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3		NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0	13	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39	39	
SMTC-SSB parameters on NR RF Channel 1		Config 1,4	SSB.1 FR1		As specified in clause A.3.10.1
		Config 2,5	SSB.1 FR1		As specified in clause A.3.10.1
		Config 3,6	SSB.2 FR1		As specified in clause A.3.10.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3,4,5,6	SSB.1 FR2		As specified in clause A.3.10.2
offsetMO	dB	Config 1,2,3,4,5,6	6		
Hysteresis	dB	Config 1,2,3,4,5,6	0		
a4-Threshold	dBm	Config 1,2,3,4,5,6	TBD		
CP length		Config 1,2,3,4,5,6	Normal		
TimeToTrigger	s	Config 1,2,3,4,5,6	0		
Filter coefficient		Config 1,2,3,4,5,6	0		L3 filtering is not used
DRX		Config 1,2,3,4,5,6	OFF		DRX is not used
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 µs		Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3µs		Synchronous cells.
T1	s	Config 1,2,3,4,5,6	5		
T2	s	Config 1,2,3,4,5,6	TBD	TBD	

Table 5.6.2.7.4-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table TBD and TS 38.508-1 [14] clause TBD	

Channel bandwidth	As specified by the test configuration selected from Table 4.6.2.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	TBD		

1. Message contents are defined in clause 5.6.2.7.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR2 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex TBD

5.6.2.7.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 5.6.2.7.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 5.6.2.7.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 5.6.2.7.4-2 .
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit RRCConnectionReconfigurationComplete message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.7.4.1-2 .
6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.
7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]
9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters

Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
or:
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 5.6.2.7.41.-2 as appropriate.

TBD5.6.2.7.4.3 Message contents

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

Table 5.6.2.7.4.3-1: Common Exception messages for Additional EN-DC FR1-FR2 event triggered reporting tests with SSB time index detection in non-DRX test requirement

Default Message Contents	
Common contents of system information blocks exceptions	Table H. TBD
Default RRC messages and information elements contents exceptions	Table H. TBD

TBD

5.6.2.7.5 Test requirement

Table 5.6.2.7.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.2.7.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test configuration	Cell 2 T1	Cell 2 T2	Cell 3 T1	Cell 3 T2
NR RF Channel Number		Config 1,2,3,4,5,6	1		2	
Duplex mode		Config 1,4	FDD		TDD	
		Config 2,3,5,6	TDD		TDD	
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 2,5	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 3,6	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP BW	MHz	Config 1,4	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 2,5	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 3,6	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2,3,4,5,6	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,4	SR.1.1 FDD		-	
		Config 2,5	SR.1.1 TDD			
		Config 3,6	SR2.1 TDD			
CORESET Reference Channel		Config 1,4	CR.1.1 FDD		-	
		Config 2,5	CR.1.1 TDD			
		Config 3,6	CR2.1 TDD			
TDD configuration		Config 2,5	TDDConf.1.1		TDDConf.3.1	
		Config 3,6	TDDConf.2.1		TDDConf.3.1	
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1		NA	
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1		NA	
SMTC configuration defined in A.3.11.1 and A.3.11.2		Config 1,4	SMTC.2		SMTC.2	
		Config 2,3,5,6	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15		120	
		Config 3,6	30		120	
EPRE ratio of PSS to SSS		Config 1,2,3,4,5,6	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
UE orientation around TBD axis and TBD axis	degrees	Config 1,2,3,4,5,6	NA		TBD	
Relative difference in angle of arrival of cell 3 relative to cell 2	degrees	Config 1,2,3,4,5,6	NA		NA	TBD
N_{oc} Note2	dBm/15 kHz Note5		NA		TBD	

N_{oc} Note2	dBm/SCS Note4	Config 1,2,4,5	NA		TBD	
		Config 3,6	NA		TBD	
SS-RSRP Note 3	dBm/SCS Note5	Config 1,2,4,5	NA	NA	-Infinity	TBD
		Config 3,6	NA	NA	-Infinity	TBD
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3,4,5,6	NA	NA	-Infinity	TBD
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6	NA	NA	-Infinity	TBD
Io Note3	dBm/9.36MHz	Config 1,2,4,5	NA	NA	-	-
	dBm/38.16MHz	Config 3,6	NA	NA	-	-
	dBm/95.04 MHz Note5	Config 1,2,3,4,5,6	-	-	-Infinity	TBD
Propagation Condition		Config 1,2,3,4,5,6	AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone

In test 1 with per-UE gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

5.6.2.8 EN-DC FR1-FR2 event-triggered reporting in DRX with SSB time index detection

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.
- Cell Configuration table in Annex E is undefined.
- Antenna diagram is TBD
- Message content is TBD
- Test case applicability is TBD

- Minimum conformance requirements are TBD
- Test requirement is TBD
- Initial conditions contains TBDs
- TC will be moved to FR2 section 5.6.2

5.6.2.8.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX within inter-frequency cell search requirements with SSB time index detection.

5.6.2.8.2 Test applicability

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

5.6.2.8.3 Minimum conformance requirements

TBD

5.6.2.8.4 Test description

5.6.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.8.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.2.8.4.1-2. Test environment parameters are given in Table 5.6.2.8.4.1-3.

Table 5.6.2.8.4.1-1: EN-DC FR1-FR2 event triggered reporting tests in DRX with SSB time index detection supported test configurations

Test Case ID	Description of serving cell	Description of target cell
5.6.2.8-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.2.8-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
5.6.2.8-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
5.6.2.8-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	
5.6.2.8-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
5.6.2.8-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2		

Table A.5.6.2.8.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1				One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2				Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)				LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3				NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0		13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39		39		
SMTC-SSB parameters on NR RF Channel 1		Config 1,4	SSB.1 FR1				As specified in clause A.3.10.1
		Config 2,5	SSB.1 FR1				As specified in clause A.3.10.1
		Config 3,6	SSB.2 FR1				As specified in clause A.3.10.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3,4,5,6	SSB.1 FR2				As specified in clause A.3.10.2
offsetMO	dB	Config 1,2,3,4,5,6	6				
Hysteresis	dB	Config 1,2,3,4,5,6	0				
a4-Threshold	dBm	Config 1,2,3,4,5,6	TBD				
CP length		Config 1,2,3,4,5,6	Normal				
TimeToTrigger	s	Config 1,2,3,4,5,6	0				
Filter coefficient		Config 1,2,3,4,5,6	0				L3 filtering is not used
DRX		Config 1,2,3,4,5,6	DRX.1	DRX.2	DRX.1	DRX.2	DRX is used
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 µs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms				Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3µs				Synchronous cells.
T1	s	Config 1,2,3,4,5,6	5				
T2	s	Config 1,2,3,4,5,6	TBD	TBD	TBD	TBD	

Table 5.6.2.8.4-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table TBD and TS 38.508-1 [14] clause TBD	

<table>
<tr><td>Channel bandwidth</td><td colspan="3">As specified by the test configuration selected from Table 4.6.2.3.4.1-1.</td></tr>
<tr><td>Propagation conditions</td><td colspan="2">AWGN</td><td>As specified in Annex C.2.2.</td></tr>
<tr><td rowspan="2">Connection Diagram</td><td>TE Part</td><td>TBD</td><td rowspan="2">As specified in TS 38.508-1 [14] Annex A.</td></tr>
<tr><td>DUT Part</td><td>TBD</td></tr>
<tr><td>Exceptions to connection diagram</td><td colspan="2">TBD</td><td></td></tr>
</table>

1. Message contents are defined in clause 5.6.2.8.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR2 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex TBD

5.6.2.8.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 5.6.2.8.4.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 5.6.2.8.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

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

2. Set the parameters according to T1 in Table 5.6.2.8.4-2 .

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.8.4.1-2 .

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters

Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
or:
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 5.6.2.8.4.1-2 as appropriate.

TBD5.6.2.8.4.3 Message contents

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

Table 5.6.2.8.4.3-1: Common Exception messages for Additional EN-DC FR1-FR2 event triggered reporting tests with SSB time index detection in DRX test requirement

Default Message Contents	
Common contents of system information blocks exceptions	Table H. TBD
Default RRC messages and information elements contents exceptions	Table H. TBD

TBD

5.6.2.8.5 Test requirement

Table 5.6.2.8.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.2.8.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
NR RF Channel Number		Config 1,2,3,4,5,6	1		2	
Duplex mode		Config 1,4	FDD		TDD	
		Config 2,3,5,6	TDD		TDD	
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 2,5	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 3,6	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP BW	MHz	Config 1,4	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 2,5	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 3,6	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2,3,4,5,6	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,4	SR.1.1 FDD		-	
		Config 2,5	SR.1.1 TDD			
		Config 3,6	SR2.1 TDD			
CORESET Reference Channel		Config 1,4	CR.1.1 FDD		-	
		Config 2,5	CR.1.1 TDD			
		Config 3,6	CR2.1 TDD			
TDD configuration		Config 2,5	TDDConf.1.1		TDDConf.3.1	
		Config 3,6	TDDConf.2.1		TDDConf.3.1	
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1		NA	
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1		NA	
SMTC configuration defined in A.3.11.1 and A.3.11.2		Config 1,4	SMTC.2		SMTC.2	
		Config 2,3,5,6	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15		120	
		Config 3,6	30		120	
EPRE ratio of PSS to SSS		Config 1,2,3,4,5,6	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
UE orientation around TBD axis and TBD axis	degrees	Config 1,2,3,4,5,6	NA		TBD	
Relative difference in angle of arrival of cell 3 relative to cell 2	degrees	Config 1,2,3,4,5,6	NA		NA	TBD
N_{oc} Note2	dBm/15 kHz Note5		NA		TBD	

N_{oc} Note2	dBm/SCS Note4	Config 1,2,4,5	NA		TBD	
		Config 3,6	NA		TBD	
SS-RSRP Note 3	dBm/SCS Note5	Config 1,2,4,5	NA	NA	TBD	TBD
		Config 3,6	NA	NA	TBD	TBD
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3,4,5,6	NA	NA	TBD	TBD
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6	NA	NA	TBD	TBD
Io Note3	dBm/9.36MHz	Config 1,2,4,5	NA	NA	-	-
	dBm/38.16MHz	Config 3,6	NA	NA	-	-
	dBm/95.04 MHz Note5	Config 1,2,3,4,5,6	-	-	TBD	TBD
Propagation Condition		Config 1,2,3,4,5,6	AWGN			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone						

In test 1 with per-UE gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2 , 3 and 4 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

5.7 Measurement performance requirements

5.7.1 SS-RSRP

5.7.1.1 Intra-frequency measurements

5.7.1.2 Inter-frequency measurements

5.7.2 SS-RSRQ

5.7.3 SS-SINR

6 NR standalone in FR1

This section contains test scenarios for NR standalone. This configuration is also known as SA Option 2. All NR cells are in Frequency Range 1.

6.1 RRC_IDLE state mobility

6.1.1 NR cell re-selection

6.1.1.0 Minimum conformance requirements

6.1.1.0.1 Minimum conformance requirements for intra-frequency cell re-selection

The cell re-selection delay shall be less than $T_{evaluate\ NR\_Intra} + T_{SI\text{-}NR}$ in RRC_IDLE state.

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

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS38.304 [TBD] within T_{detect,NR_Intra} as defined in table 4.2.2.3-1 of TS 38.133 [6] when that Treselection= 0 . An intra frequency cell is considered to be detectable according to the conditions defined in Annex B.1.2 of TS 38.133 [6] for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every $T_{measure,NR\_Intra}$ (see table 4.2.2.3-1 of TS 38.133 [6]) for intra-frequency cells that are identified and measured according to the measurement rules.

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

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

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined within $T_{evaluate,NR\_Intra}$ when $T_{reselection} = 0$ as specified in table 4.2.2.3-1 of TS 38.133 [6] provided that the cell has at least [3]dB better ranked.

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

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

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.2 and 4.2.2.3.

6.1.1.0.2 Minimum conformance requirements for inter-frequency cell re-selection

The cell re-selection delay shall be less than $T_{evaluate\ NR\_Intra}$ + T_{SI-NR} in RRC_IDLE state.

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

If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-frequency layers of higher priority at least every $T_{higher\_priority\_search}$ where $T_{higher\_priority\_search}$ is described in clause 4.2.2.7 of TS 38.133 [6].

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

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS38.304 [TBD] within $K_{carrier}$ * T_{detect,NR_Inter} if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when $T_{reselection}$ = 0 provided that the reselection criteria is met by a margin of at least [5] dB for reselections based on ranking or [6]dB for SS-RSRP reselections based on absolute priorities or [4]dB for SS-RSRQ reselections based on absolute priorities. The parameter $K_{carrier}$ is the number of NR inter-frequency carriers indicated by the serving cell. An inter-frequency cell is considered to be detectable according to the conditions defined in Annex B.1.3 of TS 38.133 [6] for a corresponding Band.

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

The UE shall measure SS-RSRP or SS-RSRQ at least every $K_{carrier}$ * $T_{measure,NR\_Inter}$ (see table 4.2.2.4-1 of TS 38.133 [6]) for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

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

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

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 38.304 [TBD] within $K_{carrier}$ * $T_{evaluate,NR\_Inter}$ when $T_{reselection}$ = 0 as specified in table 4.2.2.4-1 of TS 38.133 [6] provided that the reselection criteria is met by

- the condition when performing equal priority reselection and the cell has at least [5]dB better ranked
- [6]dB for SS-RSRP reselections based on absolute priorities or
- [4]dB for SS-RSRQ reselections based on absolute priorities.

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

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

The UE is not expected to meet the measurement requirements for an inter-frequency carrier under DRX cycle=320 ms defined in Table 4.2.2.4-1 of TS 38.133 [6] under the following conditions:

- $T_{SMTC\_intra} = T_{SMTC\_inter}$ = 160 ms; where T_{SMTC_intra} and T_{SMTC_inter} are periodicities of the SMTC occasions configured for the intra-frequency carrier and the inter-frequency carrier respectively,

- SMTC occasions configured for the inter-frequency carrier occur up to TBD ms before the start or up to TBD ms after the end of the SMTC occasions configured for the intra-frequency carrier and

- SMTC occasions configured for the intra-frequency carrier and for the inter-frequency carrier occur up to TBD ms before the start or up to TBD ms after the end of the paging occasion [1].

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.4.

6.1.1.1 NR SA FR1 cell re-selection

Editor's note:

- Message contents are missing.

- Some parts of TC is TBD.

- Connection diagram is TBD.

- Test tolerance is missing.

- Cell mapping is missing

6.1.1.1.1 Test purpose

The purpose of this test is to verify that when the current and target cell operates on the same carrier frequency the UE is able to search and measure cells to meet the intra-frequency cell re-selection requirements.

6.1.1.1.2 Test applicability

This test applies to all types of NR UE release 15.

6.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.1.

6.1.1.1.4 Test description

6.1.1.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.1.4.1-1.

Table 6.1.1.1.4.1-1: Supported test configurations for NR SA FR1 cell re-selection

Configuration	Description
6.1.1.1-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.1.1.1-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.1.1.1-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.1.4.1-2.

Table 6.1.1.1.4.1-2: Initial conditions for NR SA FR1 cell re-selection

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.1.1.1.4.1-3.

2. Message contents are defined in clause 6.1.1.1.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 6.1.1.1.4.1-3: General test parameters for NR SA FR1 cell re-selection

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3	Cell1	
	Neighbour cells		1, 2, 3	Cell2	
T2 end condition	Active cell		1, 2, 3	Cell2	
	Neighbour cells		1, 2, 3	Cell1	
Final condition	Active cell		1, 2, 3	Cell1	
RF Channel Number			1, 2, 3	1	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 µs	Synchronous cells
			3	3 µs	Synchronous cells
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC pattern 2	
			2	SMTC pattern 1	
			3	SMTC pattern 1	
DRX cycle length		s	1, 2, 3	1.28	The value shall be used for all cells in the test.
PRACH configuration index			1, 2, 3	87	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2, 3	Not configured	
T1		s	1, 2, 3	>7	During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2
T2		s	1, 2, 3	TBD	T2 needs to be defined so that cell re-selection reaction time is taken into account.
T3		s	1, 2, 3	TBD	T3 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.1.1.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency as the PSCell. The test consists of 3 successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure according to TS TS 38.508-1 [14] clause TBD”.

1. Ensure the UE is in State [TBD] according to TS 38.508-1 [14] clause [TBD]. Set Cell 2 physical cell identity = initial cell 2 physical cell identity.
2. Set the parameters according to T1 in Table 6.1.1.1.5-1. Propagation conditions are set according to Annex B clause B.1.1. T1 starts.
3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.1.5-1.
5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.
6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within [TBD] seconds from the beginning of time period T2, then count a success for the event “Re-select newly detected Cell 2”. Otherwise count a fail for the event “Re-select newly detected Cell 2”.
7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 8. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, skip to step 12.
8. The SS shall switch the power setting from T2 to T3 as specified in Table 6.1.1.1.5-1.
9. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.
10. If the UE responds on the already detected cell, Cell 1 during time duration T3 within [TBD] seconds from the beginning of time period T3, then count a success for the event “Re-select already detected Cell 1”. Otherwise count a fail for the event “Re-select already detected Cell 1”.
11. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, skip to step 13. Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, continue with step 12.
12. Switch off and on the UE and ensure the UE is in State [TBD] according to TS 38.508-1 [14] clause [TBD] in Cell 1.
13. Repeat step 2-12 until a test verdict has been achieved.
    Each of the events “Re-select newly detected Cell 2” and “Re-select already detected Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

6.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.1.1.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

6.1.1.1.5 Test requirement

Tables 6.1.1.1.4.1-3 and 6.1.1.1.5-1 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case.

Table 6.1.1.1.5-1: Cell specific test parameters for NR SA FR1 cell re-selection

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1	SR.1.1 FDD			N/A		
		2	SR.1.1 TDD					
		3	SR.2.1 TDD					
RMSI CORESET RMC configuration		1	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1			OP.1 defined in A.3.2.1		
Initial DL BWP configuration		1, 2, 3	DLBWP.0			DLBWP.0		
Initial UL BWP configuration		1, 2, 3	ULBWP.0			ULBWP.0		
RLM-RS		1, 2, 3	SSB			SSB		
Qrxlevmin	dBm/SCS	1, 2	-140			-140		
		3	-137			-137		
Pcompensation	dB	1, 2, 3	0			0		
$Qhyst_s$	dB	1, 2, 3	0			0		
$Qoffset_{s,n}$	dB	1, 2, 3	0			0		
Cell_selection_and_reselection_quality_measurement		1, 2, 3	SS-RSRP			SS-RSRP		
$\hat{E}_s/I_{ot}$	dB	1	16+TT	-3.11+TT	2.79+TT	-infinity	2.79+TT	-3.11+TT
		2						
		3						
N_{oc} Note2	dBm/SCS	1	-98+TT					
		2	-98+TT					
		3	-95+TT					
N_{oc} Note2	dBm/15 kHz	1	-98+TT					
		2						
		3						
$\hat{E}_s/N_{oc}$	dB	1	16+TT	13+TT	16+TT	-infinity	16+TT	13+TT
		2						
		3						
SS-RSRP Note3	dBm/SCS	1	-82+TT	-85+TT	-82+TT	-infinity	-82+TT	-85+TT
		2	-82+TT	-85+TT	-82+TT	-infinity	-82+TT	-85+TT
		3	-79+TT	-82+TT	-79+TT	-infinity	-79+TT	-82+TT
Io	dBm/9.36 MHz	1	-53.94+TT	-52.21+TT	-52.21+TT	-infinity	-52.21+TT	-52.21+TT
	dBm/9.36 MHz	2	-53.94+TT	-52.21+TT	-52.21+TT	-infinity	-52.21+TT	-52.21+TT
	dBm/38.16 MHz	3	-47.85+TT	-46.12+TT	-46.12+TT	-infinity	-46.12+TT	-46.12+TT
Treselection	s	1, 2, 3	0	0	0	0	0	0
Sintrasearch	dB	1, 2, 3	Not sent			Not sent		
Propagation Condition		1, 2, 3	AWGN					
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.								

The cell re-selection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a newly detectable cell test requirement in this case is expressed as:

Cell re-selection delay to a newly detectable cell = $T_{detect,NR\_Intra} + T_{SI-NR}$

T_{detect,NR_Intra} = [TBD] s; as specified in TS 38.133 [6] clause 4.2.2.3.

T_{SI-NR} = [TBD] ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to a newly detectable cell shall be less than a total of [TBD] seconds in this test case (note: this gives a total of [TBD] seconds but the test allows [TBD] seconds).

The cell re-selection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected cell test requirement in this case is expressed as:

Cell re-selection to an already detected cell delay = $T_{evaluate,NR\_Intra} + T_{SI-NR}$

$T_{evaluate,NR\_Intra}$ = [TBD] s; as specified in TS 38.133 [6] clause 4.2.2.3.

T_{SI-NR} = [TBD] ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to an already detected cell shall be less than a total of [TBD] seconds in this test case (note: this gives a total of [TBD] seconds but the test allows 8 seconds).

For the test to pass, both events above shall pass.

The statistical pass/ fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

6.1.1.2 NR SA FR1-FR1 cell re-selection

Editor's note:

- Message contents are missing.

- Some parts of TC is TBD.

- Connection diagram is TBD.

- Test tolerance is missing.

- Cell mapping is missing

6.1.1.2.1 Test purpose

The purpose of this test is to verify the requirement for the inter frequency NR cell reselection.

6.1.1.2.2 Test applicability

This test applies to all types of NR UE release 15.

6.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.2.

6.1.1.2.4 Test description

6.1.1.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.2.4.1-1.

Table 6.1.1.2.4.1-1: Supported test configurations for NR SA FR1-FR1 cell re-selection

Configuration	Description of serving cell	Description of target cell
6.1.1.2-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.1.1.2-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.1.1.2-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.2.4.1-2.

Table 6.1.1.2.4.1-2: Initial conditions for NR SA FR1-FR1 cell re-selection

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.1.1.2.4.1-3.

2. Message contents are defined in clause 6.1.1.2.4.3.

3. There is two NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell in a different carrier than cell 1. Cell 1 and Cell 2 are configured according to Annex [TBD].

Table 6.1.1.2.4.1-3: General test parameters for NR SA FR1-FR1 cell re-selection

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3	Cell2	The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1
T1 end condition	Active cell		1, 2, 3	Cell1	The UE shall perform reselection to cell 1 during T1
	Neighbour cells		1, 2, 3	Cell2	
T3 end condition	Active cell		1, 2, 3	Cell2	The UE shall perform reselection to cell 2 with higher priority during T3
RF Channel Number			1, 2, 3	1, 2	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 µs	Synchronous cells
			3	3 µs	Synchronous cells
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC pattern 2	
			2	SMTC pattern 1	
			3	SMTC pattern 1	
DRX cycle length		s	1, 2, 3	1.28	The value shall be used for all cells in the test.
PRACH configuration index			1, 2, 3	87	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2, 3	Not configured	
T1		s	1, 2, 3	TBD	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3	>7	During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3.
T3		s	1, 2, 3	TBD	T3 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.1.2.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1. Furthermore, UE has not registered with network for the tracking area containing cell 1.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure according to TS TS 38.508-1 [14] clause TBD”.

1. Ensure the UE is in State [TBD] according to TS 38.508-1 [14] clause [TBD].
2. Set the parameters according to T1 in Table 6.1.1.2.5-1. Propagation conditions are set according to Annex B clause B.1.1. T1 starts.
3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for one iteration of the test procedure loop.

4. The SS waits for random access requests information from the UE to perform cell re-selection on the lower priority cell, Cell 1.

5. If the UE responds on lower priority cell, Cell 1 during time duration T1 within [TBD] seconds from the beginning of time period T1, then count a success for the event "Re-select lower priority Cell 1". Otherwise count a fail for the event "Re-select lower priority Cell 1".

6. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 7. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, skip to step 12.

7. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.2.5-1. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) shall be changed to ensure Cell 2 is not detected by the UE.

8. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.1.1.2.5-1.

9. The SS waits for random access requests information from the UE to perform cell re-selection on the higher priority cell, Cell 2.

10. If the UE responds on higher priority cell, Cell 2 during time duration T3 within [TBD] seconds from the beginning of time period T3, then count a success for the event "Re-select higher priority Cell 2". Otherwise count a fail for the event "Re-select higher priority Cell 2".

11. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, skip to step 13. Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, continue with step 12.

12. Switch off and on the UE and ensure the UE is in State [TBD] according to TS 38.508-1 [14] clause [TBD] in Cell 2.

13. Repeat step 3-12 until a test verdict has been achieved.
    Each of the events "Re-select lower priority Cell 1" and "Re-select higher priority Cell 2" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

6.1.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.1.1.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

6.1.1.2.5 Test requirement

Tables 6.1.1.2.4.1-2 and 6.1.1.2.5-1 define the primary level settings including test tolerances for inter frequency NR cell re-selection test case.

Table 6.1.1.2.5-1: Cell specific test parameters for NR SA FR1-FR1 cell re-selection

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1	SR.1.1 FDD			N/A		
		2	SR.1.1 TDD					
		3	SR.2.1 TDD					
RMSI CORESET RMC configuration		1	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1			OP.1 defined in A.3.2.1		
Initial DL BWP configuration		1, 2, 3	DLBWP.0			DLBWP.0		
Initial UL BWP configuration		1, 2, 3	ULBWP.0			ULBWP.0		
RLM-RS		1, 2, 3	SSB			SSB		
Qrxlevmin	dBm/SCS	1, 2	-140			-140		
		3	-137			-137		
Pcompensation	dB	1, 2, 3	0			0		
$Qhyst_s$	dB	1, 2, 3	0			0		
$Qoffset_{s,n}$	dB	1, 2, 3	0			0		
Cell_selection_and_reselection_quality_measurement		1, 2, 3	SS-RSRP			SS-RSRP		
$\hat{E}_s/I_{ot}$	dB	1	14	14	14	-4	-infinity	12
		2						
		3						
N_{oc} Note2	dBm/SCS	1	-98					
		2	-98					
		3	-95					
N_{oc} Note2	dBm/15 kHz	1	-98					
		2						
		3						
$\hat{E}_s/N_{oc}$	dB	1	14	14	14	-4	-infinity	12
		2						
		3						
SS-RSRP Note3	dBm/SCS	1	-84	-84	-84	-102	-infinity	-86
		2	-84	-84	-84	-102	-infinity	-86
		3	-81	-81	-81	-99	-infinity	-83
Io	dBm/9.36 MHz	1	-55.88	-55.88	-55.88	-68.60	-infinity	-57.78
	dBm/9.36 MHz	2	-55.88	-55.88	-55.88	-68.60	-infinity	-57.78
	dBm/38.16 MHz	3	-49.79	-49.79	-49.79	-62.50	-infinity	-51.69
Treselection	s	1, 2, 3	0	0	0	0	0	0
Snonintrasearch	dB	1, 2, 3	50			Not sent		
$Thresh_{x, high}$	dB	1, 2, 3	48			48		
$Thresh_{serving, low}$	dB	1, 2, 3	44			44		
$Thresh_{x, low}$	dB	1, 2, 3	50			50		
Propagation Condition		1, 2, 3	AWGN					
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.								

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than TBD s.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to a lower priority cell shall be less than TBD s.

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher\_priority\_search}$ + $T_{evaluate, NR\_ inter}$ + T_{SI-NR}, and to a lower priority cell can be expressed as: $T_{evaluate, NR\_ inter}$ + T_{SI-NR},

Where:

$T_{higher\_priority\_search}$ See clause 4.2.2.7 of TS 38.133 [6]

$T_{evaluate, NR\_ inter}$ See Table 4.2.2.4-1 in clause 4.2.2.4 of TS 38.133 [6]

T_{SI-NR} Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; TBD ms is assumed in this test case.

This gives a total of TBD s, allow TBD s for the cell re-selection delay to a higher priority cell and TBD s for the cell re-selection delay to a lower priority cell in the test case, which we allow TBD s.

For the test to pass, both events above shall pass.

The statistical pass/ fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

6.1.2 NR – E-UTRA cell re-selection

6.1.2.0 Minimum conformance requirements

6.1.2.0.1 Minimum conformance requirements for NR – E-UTRA cell re-selection

The cell re-selection delay to a higher priority cell shall be less than $T_{higher\_priority\_search}$ + $T_{evaluate, EUTRAN}$ + $T_{SI-E-UTRA}$ in RRC_IDLE state.

The cell re-selection delay to a lower priority E-UTRA cell shall be less than $T_{evaluate, E-UTRAN}$ + $T_{SI-E-UTRA}$ in RRC_IDLE state.

If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-RAT E-UTRAN layers of higher priority at least every $T_{higher\_priority\_search}$ where $T_{higher\_priority\_search}$ is described in clause 4.2.2 of TS 38.133 [6].

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

The requirements in this section apply for inter-RAT E-UTRAN FDD measurements and E-UTRA TDD measurements. When the measurement rules indicate that inter-RAT E-UTRAN cells are to be measured, the UE shall measure RSRP and RSRQ of detected E-UTRA cells in the neighbour frequency list at the minimum measurement rate specified in this section. The parameter $N_{EUTRA\_carrier}$ is the total number of configured E-UTRA carriers in the neighbour frequency list. The UE shall filter RSRP and RSRQ measurements of each measured E-UTRA cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,EUTRAN}$/2.

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

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

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

- SCH conditions specified in TS 36.133 [15, Annex B.1.2] are fulfilled for a corresponding Band.

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

Cells which have been detected shall be measured at least every ($N_{EUTRA\_carrier}$) * $T_{measure,EUTRAN}$ when Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$.

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

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

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

For a cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that an already identified inter-RAT E-UTRA cell has met reselection criterion defined in TS 38.304 [TBD] within ($N_{EUTRA\_carrier}$) * $T_{evaluate,EUTRAN}$ when $T_{reselection}$ = 0 as speficied in table 4.2.2.5-1 of TS 38.133 [6] provided that the reselection criteria is met by a margin of at least 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities.

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

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.5.

6.1.2.1 NR SA FR1 – E-UTRA cell re-selection to higher priority E-UTRA

Editor's note:

- Message contents are not complete.

-Connection diagram is TBD.

-TT is incomplete.

- Cell mapping is missing.

- Some parts of TC are TBDs.

6.1.2.1.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in clause 4.2.2.5 of TS 38.133 [6] when the E-UTRAN cell is of higher priority.

6.1.2.1.2 Test applicability

This test applies to all types of NR UE release 15.

6.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.1.

6.1.2.1.4 Test description

6.1.2.1.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.1.4.1-1.

Table 6.1.2.1.4.1-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell
6.1.2.1-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.1-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.1-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.1-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.1-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.1-6	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equirement and the DUT according to the parameters in Table 6.1.2.1.4.1-2.

Table 6.1.2.1.4.1-2: Initial conditions for NR SA FR1 – E-URTA cell re-selection o higher priority E-UTRA

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.1.2.1.4.1-3.

2. Message contents are defined in clause 6.1.2.1.4.3.

3. There is one E-UTRA carrier and 1 E-UTRA cell specified in the test. There is one NR carrier and 1 NR Cells specified in the test. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 6.1.2.1.4.1-3: General test parameters for NR to higher priority E-UTRAN cell re-selection test case

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE camps on cell 1 in the initial phase and during T2 period the UE reselects to cell 2.
T2 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2 during T2.
	Neighbour cells		1, 2, 3, 4, 5, 6	Cell1	
T3 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE shall perform reselection to cell 1 during T3 for iteration of the tests.
	Neighbour cells		1, 2, 3, 4, 5, 6	Cell2	
Access Barring Information		-	1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access procedure.
DRX cycle length		s	1, 2, 3, 4, 5, 6	1.28	The value shall be used for all cells in the test.
NR PRACH configuration index			1, 2, 3, 4, 5, 6	87	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN PRACH configuration index			1, 2, 3, 4, 5, 6	4	As specified in table 5.7.1-2 in TS 36.211
T1		s	1, 2, 3, 4, 5, 6	>7	During T1, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T2.
T2		s	1, 2, 3, 4, 5, 6	75	T2 needs to be defined so that cell re-selection reaction time is taken into account.
T3		s	1, 2, 3, 4, 5, 6	15	T3 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.2.1.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. NR cell 1 is already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of higher priority than cell 1.

Before T1 the UE is camped on to cell 1. During T1, cell 2 shall be powered off. At the start of T2 the UE is expected to detect cell 2, send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Routing Area Update procedure on cell 2. At the start of T3 cell 2 becomes weaker than cell 1, and the UE reselects to Cell 1.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure according to TS 38.508-1 [14] clause TBD”.

1. Ensure the UE is in State [TBD] according to TS 38.508-1 [14] clause [TBD].
2. Set the parameters according to T1 in Table 6.1.2.1.5-1 and 6.1.2.1.5-2. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.
3. During T1, Cell 2 shall be powered off and set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for one iteration of the test procedure loop.
4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.1.5-1 and 6.1.2.1.5-2.
5. The SS waits for random access requests information from the UE to perform cell re-selection to a higher priority cell, Cell 2.

6. If the UE responds on Cell 2 during time duration T2 within 68 seconds from the beginning of time period T2, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 8. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, skip to step 11.
8. The SS shall switch the power setting from T2 to T3 as specified in Table 6.1.2.1.5-1 and 6.1.2.1.5-2.
9. The SS waits for random access requests information from the UE to perform cell re-selection to a lower priority cell, Cell 1.
10. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, skip to step 12. Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, continue with step 11.
11. Switch off and on the UE and ensure the UE is in State [TBD] according to TS 38.508-1 [14] clause [TBD] in Cell 1.
12. Repeat step 2-11 until a test verdict has been achieved.

6.1.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.1.2.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

6.1.2.1.5 Test requirement

Tables 6.1.2.1.4.1-3, 6.1.2.1.5-1 and 6.1.2.1.5-2 define the primary level settings including test tolerances for higher priority E-UTRA cell re-selection test case.

Table 6.1.2.1.5-1: Cell specific test parameters for NR cell 1

Parameter	Unit	Test configuration	Cell 1		
			T1	T2	T3
TDD configuration		1, 4	N/A		
		2, 5	TDDConf.1.1		
		3, 6	TDDConf.2.1		
PDSCH parameters		1, 4	SR.1.1 FDD		
		2, 5	SR.1.1 TDD		
		3, 6	SR.2.1 TDD		
RMSI CORESET parameters		1, 4	CR.1.1 FDD		
		2, 5	CR.1.1 TDD		
		3, 6	CR.2.1 TDD		
Dedicated CORESET parameters		1, 4	CCR.1.1 FDD		
		2, 5	CCR.1.1 TDD		
		3, 6	CCR.2.1 TDD		
SSB parameters		1, 4	SSB.1 FR1		
		2, 5	SSB.1 FR1		
		3, 6	SSB.2 FR1		
NR SMTC parameters		1, 4	SMTC pattern 2		
		2, 5	SMTC pattern 1		
		3, 6	SMTC pattern 1		

OCNG Pattern		1, 2, 3, 4, 5, 6	OP.1 defined in A.3.2.1		
Initial DL BWP configuration		1, 2, 3, 4, 5, 6	DLBWP.0		
Initial UL BWP configuration		1, 2, 3, 4, 5, 6	ULBWP.0		
RLM-RS		1, 2, 3, 4, 5, 6	SSB		
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140		
		3, 6	-137		
N_{oc}	dBm/SCS	1, 4	-98		
		2, 5	-98		
		3, 6	-95		
N_{oc}	dBm/15 kHz	1, 2, 3, 4, 5, 6	-98		
SS-RSRP	dBm/SCS	1, 4	-84	-84	-84
		2, 5	-84	-84	-84
		3, 6	-81	-81	-81
$\hat{E}_s/I_{ot}$	dB	1, 4	14	14	14
		2, 5			
		3, 6			
$\hat{E}_s/N_{oc}$	dB	1, 4	14	14	14
		2, 5			
		3, 6			
Io	dBm/9.36 MHz	1, 4	-55.88	-55.88	-55.88
	dBm/9.36 MHz	2, 5	-55.88	-55.88	-55.88
	dBm/38.16 MHz	3, 6	-49.79	-49.79	-49.79
Treselection	S	1, 2, 3, 4, 5, 6	0		
Snonintrasearch	dB	1, 2, 3, 4, 5, 6	50		
$Thresh_{x, high}$ (Note 2)	dB	1, 2, 3, 4, 5, 6	48		
$Thresh_{serving, low}$	dB	1, 2, 3, 4, 5, 6	44		
$Thresh_{x, low}$	dB	1, 2, 3, 4, 5, 6	50		
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN		
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: This refers to the value of $Thresh_{x, high}$ which is included in NR system information, and is a threshold for the E-UTRA target cell					

Table 6.1.2.1.5-2: Cell specific test parameters for E-UTRA cell 2

Parameter	Unit	Cell 2		
		T1	T2	T3

E-UTRA RF Channel number		1		
$BW_{channel}$	MHz	10		
OCNG Patterns defined in TS 36.133 clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6		
PBCH_RA	dB	0		
PBCH_RB	dB			
PSS_RA	dB			
SSS_RA	dB			
PCFICH_RB	dB			
PHICH_RA	dB			
PHICH_RB	dB			
PDCCH_RA	dB			
PDCCH_RB	dB			
PDSCH_RA	dB			
PDSCH_RB	dB			
OCNG_RA Note 1	dB			
OCNG_RB Note 1	dB			
Qrxlevmin	dBm	-140		
N_{oc}	dBm/15 kHz	-98		
RSRP	dBm/15 KHz	-infinity	-86	-102
$\hat{E}_s/I_{ot}$	dB	-infinity	12	-4
$\hat{E}_s/N_{oc}$	dB	-infinity	12	-4
$Treselection_{EUTRAN}$	S	0		
Snonintrasearch	dB	Not sent		
$Thresh_{x,\ high}$ (Note 2)	dB	48		
$Thresh_{serving,\ low}$	dB	44		
$Thresh_{x,\ low}$	dB	50		
Propagation Condition		AWGN		
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: This refers to the value of $Thresh_{x,\ high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell				

The cell reselection delay to a higher priority E-UTRAN cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher\_priority\_search}$ + $T_{evaluate,\ E\text{-}UTRAN}$ + $T_{SI\text{-}E\text{-}UTRA}$,

Where:

$T_{higher\_priority\_search}$ See clause 4.2.2.7 of TS 38.133 [6]

$T_{evaluate,\ E\text{-}UTRAN}$ See Table 4.2.2.5-1 in clause 4.2.2.5 of TS 38.133 [6]

$T_{SI\text{-}E\text{-}UTRA}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority E-UTRAN cell.

6.1.2.2 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- Update cell1/2 due to power levels for test procedure change.

-TT is incomplete.

- Cell mapping is missing.

- Some parts of TC are TBDs.

6.1.2.2.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in clause 4.2.2.5 of TS 38.133 [6] when the E-UTRAN cell is of lower priority.

6.1.2.2.2 Test applicability

This test applies to all types of NR UE release 15.

6.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.2.

6.1.2.2.4 Test description

6.1.2.2.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.2.4.1-1.

Table 6.1.2.2.4.1-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell
6.1.2.2-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.2-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.2-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.2-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.2-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.2-6	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equirement and the DUT according to the parameters in Table 6.1.2.2.4.1-2.

Table 6.1.2.2.4.1-2: Initial conditions for NR SA FR1 – E-URTA cell re-selection o lower priority E-UTRA

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.1.2.2.4.1-3.

2. Message contents are defined in clause 6.1.2.2.4.3.

3. There is one E-UTRA carrier and 1 E-UTRA cell specified in the test. There is one NR carrier and 1 NR Cells specified in the test. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 6.1.2.2.4.1-3: General test parameters for NR to lower priority E-UTRAN cell re-selection test case

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE camps on cell 1 in the initial phase.
T1 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2 during T1.
	Neighbour cells		1, 2, 3, 4, 5, 6	Cell1	
T2 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE shall perform reselection to cell 1 during T2 for iteration of the tests.
	Neighbour cells		1, 2, 3, 4, 5, 6	Cell2	
Access Barring Information		-	1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access procedure.
DRX cycle length		s	1, 2, 3, 4, 5, 6	1.28	The value shall be used for all cells in the test.
NR PRACH configuration index			1, 2, 3, 4, 5, 6	87	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN PRACH configuration index			1, 2, 3, 4, 5, 6	4	As specified in table 5.7.1-2 in TS 36.211
T1		s	1, 2, 3, 4, 5, 6	15	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3, 4, 5, 6	75	T2 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.2.2.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of three successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1.

At T1 the UE is camped on to Cell 1. Cell 2 is of lower priority than Cell 1. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure according to TS 38.508-1 [14] clause TBD".

1. Ensure the UE is in State [TBD] according to TS 38.508-1 [14] clause [TBD].
2. Set the parameters according to T1 in Table 6.1.2.2.5-1 and 6.1.2.2.5-2. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. If the UE is already camped in Cell 1, wait until T1expires and skip to step 5.
3. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 1.
4. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 5. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, skip to step 9.
5. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.2.5-1 and 6.1.2.2.5-2.
6. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 2.
7. If the UE responds on Cell 2 during time duration T2 within 8 seconds from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
8. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, skip to step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, continue with step 9.
9. Switch off and on the UE and ensure the UE is in State [TBD] according to TS 38.508-1 [14] clause [TBD].
10. Repeat step 2-9 until a test verdict has been achieved.

6.1.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.1.2.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

6.1.2.2.5 Test requirement

Tables 6.1.2.2.4.1-3, 6.1.2.2.5-1 and 6.1.2.2.5-2 define the primary level settings including test tolerances for higher priority E-UTRA cell re-selection test case.

Table 6.1.2.2.5-1: Cell specific test parameters for NR cell 1

Parameter	Unit	Test configuration	Cell 1	
			T1	**T2**
TDD configuration		1, 4	N/A	
		2, 5	TDDConf.1.1	
		3, 6	TDDConf.2.1	
PDSCH RMC configuration		1, 4	SR.1.1 FDD	
		2, 5	SR.1.1 TDD	
		3, 6	SR.2.1 TDD	
RMSI CORESET RMC configuration		1, 4	CR.1.1 FDD	
		2, 5	CR.1.1 TDD	
		3, 6	CR.2.1 TDD	
Dedicated CORESET RMC configuration		1, 4	CCR.1.1 FDD	
		2, 5	CCR.1.1 TDD	
		3, 6	CCR.2.1 TDD	
SSB configuration		1, 4	SSB.1 FR1	
		2, 5	SSB.1 FR1	
		3, 6	SSB.2 FR1	
SMTC configuration		1, 4	SMTC pattern 2	
		2, 5	SMTC pattern 1	
		3, 6	SMTC pattern 1	
OCNG Pattern		1, 2, 3, 4, 5, 6	OP.1 defined in A.3.2.1	
Initial DL BWP configuration		1, 2, 3, 4, 5, 6	DLBWP.0	
Initial UL BWP configuration		1, 2, 3, 4, 5, 6	ULBWP.0	
RLM-RS		1, 2, 3, 4, 5, 6	SSB	
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140	
		3, 6	-137	
N_{oc}	dBm/SCS	1, 4	-98	
		2, 5	-98	
		3, 6	-95	
N_{oc}	dBm/15 kHz	1, 2, 3, 4, 5, 6	-98	
SS-RSRP	dBm/SCS	1, 4	-102	-86
		2, 5	-102	-86
		3, 6	-99	-83
$\hat{E}_s/I_{ot}$	dB	1, 4	-4	12
		2, 5		
		3, 6		
$\hat{E}_s/N_{oc}$	dB	1, 4	-4	12
		2, 5		
		3, 6		
Io	dBm/9.36 MHz	1, 4	-68.60	-57.78
	dBm/9.36 MHz	2, 5	-68.60	-57.78
	dBm/38.16 MHz	3, 6	-62.50	-51.69
Treselection	S	1, 2, 3, 4, 5, 6	0	
Snonintrasearch	dB	1, 2, 3, 4, 5, 6	50	
$Thresh_{x, high\ (Note\ 2)}$	dB	1, 2, 3, 4, 5, 6	48	
$Thresh_{serving, low}$	dB	1, 2, 3, 4, 5, 6	44	
$Thresh_{x, low}$	dB	1, 2, 3, 4, 5, 6	50	
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: This refers to the value of $Thresh_{x, high}$ which is included in NR system information, and is a threshold for the E-UTRA target cell				

Table 6.1.2.2.5-2: Cell specific test parameters for E-UTRA cell 2

Parameter	Unit	Cell 2	
		T1	T2 T3
E-UTRA RF Channel number		1	
$BW_{channel}$	MHz	10	
OCNG Patterns defined in TS 36.133 clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6	
PBCH_RA	dB	0	
PBCH_RB	dB		
PSS_RA	dB		
SSS_RA	dB		
PCFICH_RB	dB		
PHICH_RA	dB		
PHICH_RB	dB		
PDCCH_RA	dB		
PDCCH_RB	dB		
PDSCH_RA	dB		
PDSCH_RB	dB		
OCNG_RA Note 1	dB		
OCNG_RB Note 1	dB		
Qrxlevmin	dBm	-140	
N_{oc}	dBm/15 kHz	-98	
RSRP	dBm/15 KHz	-84	-84
$\hat{E}_s/I_{ot}$	dB	14	14
$\hat{E}_s/N_{oc}$	dB	14	14
$Treselection_{EUTRAN}$	S	0	
Snonintrasearch	dB	Not sent	
$Thresh_{x,\ high\ (Note\ 2)}$	dB	48	
$Thresh_{serving,\ low}$	dB	44	
$Thresh_{x,\ low}$	dB	50	
Propagation Condition		AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: This refers to the value of $Thresh_{x,\ high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell			

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

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

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: $T_{evaluate,\ E\text{-}UTRAN} + T_{SI\text{-}E\text{-}UTRA}$,

Where:

$T_{evaluate,\ E\text{-}UTRAN}$ See Table 4.2.2.5-1 in clause 4.2.2.5

$T_{SI\text{-}E\text{-}UTRA}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 7.68 s, allow 8 s for the cell re-selection delay to a lower priority E-UTRAN cell.

6.2 RRC_INACTIVE state mobility

6.3 RRC_CONNECTED state mobility

6.3.1 Handover

6.3.1.0 Minimum conformance requirements

6.3.1.0.1 Minimum conformance requirements for NR – E-UTRAN handover

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

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

Where:

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

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

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

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

Where:

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

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

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

In the interruption requirement a cell is know if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in TS 36.133 [6] clause [9.4.1].

The normative reference for this requirement is TS 38.133 [6] clause 6.1.2.1.

6.3.1.4 NR SA FR1 – E-UTRA handover with known target cell

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

-TT is incomplete.

- Cell mapping is missing.

- Some parts of TC are TBDs.

6.3.1.4.1 Test purpose

To verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1.

6.3.1.4.2 Test applicability

This test applies to all types of NR UE release 15.

6.3.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.x.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.1.

6.3.1.4.4 Test description

6.3.1.4.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.1.4.4.1-1.

Table 6.3.1.4.4.1-1: Supported test configurations

Configuration	Description
6.3.1.4-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD
6.3.1.4-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD
6.3.1.4-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD
6.3.1.4-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD
6.3.1.4-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD
6.3.1.4-6	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equirement and the DUT according to the parameters in Table 6.3.1.4.4.1-2.

Table 6.3.1.4.4.1-2: Initial conditions for NR SA FR1 – E-UTRA handover with known target cell

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.3.1.4.4.1-3.

2. Message contents are defined in clause 6.3.1.4.4.3.

3. There is one E-UTRAN carrier and 1 E-UTRAN neighbour cell specified in the test. There is one NR carrier and 1 NR PCell specified in the test. Cell 1 is the NR PCell and Cell 2 is the E-UTRAN neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 6.3.1.4.4.1-3: General test parameters for SA inter-RAT E-UTRAN handover

Parameter		Unit	Value	Comment
NR RF Channel Number			1	1 NR carrier frequency is used in the test
LTE RF Channel Number			2	1 E-UTRAN carrier frequency is used in the test
Initial conditions	Active cell		Cell 1	NR cell
	Neighbouring cell		Cell 2	E-UTRAN cell
Final condition	Active cell		Cell 2	
NR measurement quantity			SS-RSRP	
E-UTRAN measurement quantity			RSRP	
b2-Threshold1		dBm	As specified in Table A.6.3.1.4-3	Absolute NR SS-RSRP threshold for event B2
b2-Threshold2EUTRAN		dBm	-98	Absolute E-UTRAN RSRP threshold for event B2
Hysteresis		dB	0	
TimeToTrigger		s	0	
Filter coefficient			0	L3 filtering is not used
DRX			OFF	Non-DRX test
Access Barring Information		-	Not sent	No additional delays in random access procedure
Time offset between cells			3 ms	Asynchronous cells
Gap pattern configuration Id			0	As specified in Table 9.1.2-1 started before T2 starts
T1		s	5	
T2		s	□5	
T3		s	1	

6.3.1.4.4.2 Test procedure

The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 9.1.2-1 of TS 38.133 [6] is configured before T2 begins to enable inter-RAT frequency monitoring.

1. Ensure the UE is in State [TBD] according to TS 38.508-1 [14] clause [TBD]. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.1.4.5-1 and 6.3.1.4.5-2. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. The SS shall transmit an RRCConnectionReconfiguration message.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.4.5-1 and 6.3.1.4.5-2.

6. UE shall transmit a MeasurementReport message triggered by Event A3.

7. SS shall transmit an RRCConnectionReconfiguration message implying handover to Cell 2.

8. The start of T3 is the instant when the last TTI containing the RRC Connection reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.1.4.5-1 and 6.3.1.4.5-2.

9. The UE shall transmit RRCConnectionReconfigurationComplete message.

10. If the UE transmits the uplink PRACH channel to Cell 2 less than 85 ms from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

11. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State [TBD] according to TS 38.508-1 [14] clause [TBD]. Cell 1 is the active cell.

12. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

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

6.3.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.3.1.4.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

6.3.1.4.5 Test requirement

Tables 6.3.1.4.4.1-3, 6.3.1.4.5-1 and 6.3.1.4.5-2 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case.

Table 6.3.1.4.5-1: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)

Parameter	Unit	Configuration	Cell 1		
			T1	T2	T3
RF channel number		1, 2, 3, 4, 5, 6	1		
Duplex mode		1, 4	FDD		
		2, 3, 5, 6	TDD		
TDD Configuration		2, 5	TDDConf.1.1		
		3, 6	TDDConf.1.2		
$BW_{channel}$	MHz	1, 4	10: $N_{RB,c}$ = 52 (FDD)		
		2, 5	10: $N_{RB,c}$ = 52 (TDD)		
		3, 6	40: $N_{RB,c}$ = 106 (TDD)		
PDSCH reference measurement channel		1, 4	SR.1.1 FDD		
		2, 5	SR.1.1 TDD		
		3, 6	SR.2.1 TDD		
CORSET reference channel		1, 4	CR.1.1 FDD		
		2, 5	CR.1.1 TDD		
		3, 6	CR.2.1 TDD		
OCNG pattern[Note1]		1, 2, 3, 4, 5, 6	OP.1		
SMTC configuration		1, 2, 3, 4, 5, 6	SMTC.1		
SSB configuration		1, 2, 4, 5	SSB.1 FR1		
		3, 6	SSB.2 FR1		
b2-Threshold1	dBm	1, 2, 4, 5	-90		
		3, 6	-87		
EPRE ratio of PSS to SSS	dB	1, 2, 3, 4, 5, 6	0		
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS					
EPRE ratio of OCNG to OCNG DMRS					
N_{oc}[Note2]	dBm/15 KHz	1, 2, 3, 4, 5, 6	-98+TT		
N_{oc}[Note2]	dBm/SCS	1, 2, 4, 5	-98+TT		
		3, 6	-95+TT		
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	0+TT	0+TT	0+TT
$\hat{E}_s/I_{ot}$[Note3]	dB	1, 2, 3, 4, 5, 6	0+TT	0+TT	0+TT
SS-RSRP[Note3]	dBm/SCS	1, 2, 4, 5	-98+TT	-98+TT	-98+TT
		3, 6	-95+TT	-95+TT	-95+TT
Io[Note3]	dBm/9.36 MHz	1, 2, 4, 5	-67.04+TT	-67.04+TT	-67.04+TT
	dBm/38.16 MHz	3, 6	-60.94+TT	-60.94+TT	-60.94+TT
Propagation condition		1, 2, 3, 4, 5, 6	AWGN		
Antenna Configuration and Correlation Matrix		1, 2, 3, 4, 5, 6	1x2 Low		

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.3.1.4.5-2: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)

Parameter	Unit	Configuration	Cell 2		
			T1	T2	T3
RF channel number		1, 2, 3, 4, 5, 6	2		
Duplex mode		1, 2, 3	FDD		
		4, 5, 6	TDD		
TDD special subframe configuration Note1		4, 5, 6	6		
TDD uplink-downlink configuration Note1		4, 5, 6	1		
$BW_{channel}$	MHz	1, 2, 3, 4, 5, 6	5MHz: $N_{RB,c}$ = 25 10MHz: $N_{RB,c}$ = 50 20MHz: $N_{RB,c}$ = 100		
PRACH Configuration Note2		1, 2, 3	4		
		4, 5, 6	53		
PDSCH parameters: DL Reference Measurement Channel Note3		1, 2, 3	5MHz: R.7 FDD 10MHz: R.3 FDD 20MHz: R.6 FDD		
		4, 5, 6	5MHz: R.4 TDD 10MHz: R.0 TDD 20MHz: R.3 TDD		
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel Note3		1, 2, 3	5MHz: R.11 FDD 10MHz: R.6 FDD 20MHz: R.10 FDD		
		4, 5, 6	5MHz: R.11 TDD 10MHz: R.6 TDD 20MHz: R.10 TDD		
OCNG Patterns Note3		1, 2, 3	5MHz: OP.20 FDD 10MHz: OP.10 FDD 20MHz: OP.17 FDD		
		4, 5, 6	5MHz: OP.9 TDD 10MHz: OP.1 TDD 20MHz: OP.7 TDD		
PBCH_RA	dB	1, 2, 3, 4, 5, 6	0		
PBCH_RB					
PSS_RA					
SSS_RA					
PCFICH_RB					
PHICH_RA					
PHICH_RB					
PDCCH_RA					
PDCCH_RB					
PDSCH_RA					
PDSCH_RB					
OCNG_RA Note4					
OCNG_RB Note4					
N_{oc} Note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-98+TT		
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7+TT	7+TT
$\hat{E}_s/I_{ot}$ Note6	dB	1, 2, 3, 4, 5, 6	-Infinity	7+TT	7+TT
RSRP Note6	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-91+TT	-91+TT
SCH_RP Note6	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-91+TT	-91+TT
Io Note6	dBm/9MHz	1, 2, 3, 4, 5, 6	-70.22+TT	-62.43+TT	-62.43+TT
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN		
Antenna Configuration and Correlation Matrix Note7		1, 2, 3, 4, 5, 6	1x2 Low		

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211.
Note 3: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [25].

The UE shall start to transmit the PRACH to Cell 2 less than 85 ms from the beginning of time period T3.

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

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 50 ms and is specified in section 6.1.2.1 of TS 38.133 [6].

$T_{interrupt}$ = 35 ms in the test; $T_{interrupt}$ is defined in section 6.1.2.1 of TS 38.133 [6].

This gives a total of 85 ms.

6.3.1.5 NR SA FR1 – E-UTRA handover with unknown target cell

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

-TT is incomplete.

- Cell mapping is missing.

- Some parts of TC are TBDs.

6.3.1.5.1 Test purpose

To verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall verify the NR to E-UTRAN handover requirements for the case when the target E-UTRAN cell is unknown as specified in section 6.1.2.1 of TS 38.133 [6].

6.3.1.5.2 Test applicability

This test applies to all types of NR UE release 15.

6.3.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.x.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.2.

6.3.1.5.4 Test description

6.3.1.5.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.1.5.4.1-1.

Table 6.3.1.5.4.1-1: Supported test configurations for SA inter-RAT E-UTRAN handover tests

Configuration	Description

6.3.1.5-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD
6.3.1.5-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD
6.3.1.5-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD
6.3.1.5-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD
6.3.1.5-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD
6.3.1.5-6	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equirement and the DUT according to the parameters in Table 6.3.1.5.4.1-2.

Table 6.3.1.5.4.1-2: Initial conditions for NR SA FR1 – E-UTRA handover with unknown target cell

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.3.1.5.4.1-3.
2. Message contents are defined in clause 6.3.1.5.4.3.
3. There is one E-UTRAN carrier and 1 E-UTRAN neighbour cell specified in the test. There is one NR carrier and 1 NR PCell specified in the test. Cell 1 is the NR PCell and Cell 2 is the E-UTRAN neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 6.3.1.5.4.1-3: General test parameters for SA inter-RAT E-UTRAN handover

Parameter		Unit	Value	Comment
NR RF Channel Number			1	1 NR carrier frequency is used in the test
LTE RF Channel Number			2	1 E-UTRAN carrier frequency is used in the test
Initial conditions	Active cell		Cell 1	NR cell
	Neighbouring cell		Cell 2	E-UTRAN cell
Final condition	Active cell		Cell 2	
NR measurement quantity			SS-RSRP	
E-UTRAN measurement quantity			RSRP	
b2-Threshold1		dBm	As specified in Table A.6.3.1.5-3	Absolute NR SS-RSRP threshold for event B2
b2-Threshold2EUTRAN		dBm	-98	Absolute E-UTRAN RSRP threshold for event B2
Hysteresis		dB	0	
TimeToTrigger		s	0	
Filter coefficient			0	L3 filtering is not used
DRX			OFF	Non-DRX test
Access Barring Information		-	Not sent	No additional delays in random access procedure
Time offset between cells			3 ms	Asynchronous cells
T1		s	≤5	
T2		s	1	

6.3.1.5.4.2 Test procedure

The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of two successive time periods, with time durations of T1 and T2. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable. No Gap pattern shall be configured.

An RRC message implying handover shall be sent to the UE during period T1. The start of T2 is the instant when the last subframe containing the RRC message implying handover is sent to the UE. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and start to transmit the PRACH to Cell 2.

1. Ensure the UE is in State [TBD] according to TS 38.508-1 [14] clause [TBD]. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 6.3.1.5.5-1 and 6.3.1.5.5-2. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.
3. SS shall transmit an RRCConnectionReconfiguration message implying handover to Cell 2.
4. The start of T2 is the instant when the last subframe containing the RRC connection reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 6.3.1.5.5-1 and 6.3.1.5.5-2. T2 starts.
5. The UE shall transmit RRCConnectionReconfigurationComplete message.
6. If the UE transmits the uplink PRACH channel to Cell 2 less than 165 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
7. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State [TBD] according to TS 38.508-1 [14] clause [TBD]. Cell 1 is the active cell.
8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.
9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.3.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.3.1.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

6.3.1.5.5 Test requirement

Tables 6.3.1.5.4.1-3, 6.3.1.5.5-1 and 6.3.1.5.5-2 define the primary level settings including test tolerances for inter-RAT E-UTRAN handover: unknown target cell test.

Table 6.3.1.5.5-1: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)

Parameter	Unit	Configuration	Cell 1	
			T1	T2
RF channel number		1, 2, 3, 4, 5, 6	1	
Duplex mode		1, 4	FDD	
		2, 3, 5, 6	TDD	
TDD Configuration		2, 5	TDDConf.1.1	
		3, 6	TDDConf.1.2	
$BW_{channel}$	MHz	1, 4	10: $N_{RB,c}$ = 52 (FDD)	
		2, 5	10: $N_{RB,c}$ = 52 (TDD)	
		3, 6	40: $N_{RB,c}$ = 106 (TDD)	
PDSCH reference measurement channel		1, 4	SR.1.1 FDD	
		2, 5	SR.1.1 TDD	
		3, 6	SR.2.1 TDD	
CORSET reference channel		1, 4	CR.1.1 FDD	
		2, 5	CR.1.1 TDD	
		3, 6	CR.2.1 TDD	
OCNG pattern[Note1]		1, 2, 3, 4, 5, 6	OP.1	
SMTC configuration		1, 2, 3, 4, 5, 6	SMTC.1	
SSB configuration		1, 2, 4, 5	SSB.1 FR1	
		3, 6	SSB.2 FR1	
b2-Threshold1	dBm	1, 2, 4, 5	-90	
		3, 6	-87	
EPRE ratio of PSS to SSS	dB	1, 2, 3, 4, 5, 6	0	
EPRE ratio of PBCH_DMRS to SSS				
EPRE ratio of PBCH to PBCH_DMRS				
EPRE ratio of PDCCH_DMRS to SSS				
EPRE ratio of PDCCH to PDCCH_DMRS				
EPRE ratio of PDSCH_DMRS to SSS				
EPRE ratio of PDSCH to PDSCH_DMRS				
EPRE ratio of OCNG DMRS to SSS				
EPRE ratio of OCNG to OCNG DMRS				
N_{oc}[Note2]	dBm/15 KHz	1, 2, 3, 4, 5, 6	-98	
N_{oc}[Note2]	dBm/SCS	1, 2, 4, 5	-98	
		3, 6	-95	
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	0	0
$\hat{E}_s/I_{ot}$[Note3]	dB	1, 2, 3, 4, 5, 6	0	0
SS-RSRP[Note3]	dBm/SCS	1, 2, 4, 5	-98	-98
		3, 6	-95	-95
Io[Note3]	dBm/9.36 MHz	1, 2, 4, 5	-67.04	-67.04
	dBm/38.16 MHz	3, 6	-60.94	-60.94
Propagation condition		1, 2, 3, 4, 5, 6	AWGN	
Antenna Configuration and Correlation Matrix		1, 2, 3, 4, 5, 6	1x2 Low	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.3.1.5.5-2: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)

Parameter	Unit	Configuration	Cell 2	
			T1	T2
RF channel number		1, 2, 3, 4, 5, 6	2	
Duplex mode		1, 2, 3	FDD	
		4, 5, 6	TDD	
TDD special subframe configuration Note1		4, 5, 6	6	
TDD uplink-downlink configuration Note1		4, 5, 6	1	
$BW_{channel}$	MHz	1, 2, 3, 4, 5, 6	5MHz: $N_{RB,c}$ = 25 10MHz: $N_{RB,c}$ = 50 20MHz: $N_{RB,c}$ = 100	
PRACH Configuration Note2		1, 2, 3	4	
		4, 5, 6	53	
PDSCH parameters: DL Reference Measurement Channel Note3		1, 2, 3	5MHz: R.7 FDD 10MHz: R.3 FDD 20MHz: R.6 FDD	
		4, 5, 6	5MHz: R.4 TDD 10MHz: R.0 TDD 20MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel Note3		1, 2, 3	5MHz: R.11 FDD 10MHz: R.6 FDD 20MHz: R.10 FDD	
		4, 5, 6	5MHz: R.11 TDD 10MHz: R.6 TDD 20MHz: R.10 TDD	
OCNG Patterns Note3		1, 2, 3	5MHz: OP.20 FDD 10MHz: OP.10 FDD 20MHz: OP.17 FDD	
		4, 5, 6	5MHz: OP.9 TDD 10MHz: OP.1 TDD 20MHz: OP.7 TDD	
PBCH_RA	dB	1, 2, 3, 4, 5, 6	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA Note4				
OCNG_RB Note4				
N_{oc} Note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-98	
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7
$\hat{E}_s/I_{ot}$ Note6	dB	1, 2, 3, 4, 5, 6	-Infinity	7
RSRP Note6	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-91
SCH_RP Note6	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-91
Io Note6	dBm/9MHz	1, 2, 3, 4, 5, 6	-70.22	-62.43
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN	
Antenna Configuration and Correlation Matrix Note7		1, 2, 3, 4, 5, 6	1x2 Low	

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211.
Note 3: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [25].

The UE shall start to transmit the PRACH to Cell 2 less than 165 ms from the beginning of time period T2.

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

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 50 ms and is specified in section 6.1.2.1 of TS 38.133 [6].

$T_{interrupt}$ = 115 ms in the test; $T_{interrupt}$ is defined in section 6.1.2.1 of TS 38.133 [6].

This gives a total of 165 ms.

6.3.2 RRC connection mobility control

6.3.2.1 RRC re-establishment

6.3.2.2 Random access

6.3.2.2.1 Contention based random access test in FR1 for NR standalone

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Message contents

- Cell mapping

6.3.2.2.1.1 Test purpose

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

6.3.2.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.3.2.2.1.3 Minimum conformance requirement

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

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

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

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

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

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

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

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

The UE shall re-transmit the msg3 upon the reception of a NACK on msg3.

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

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

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

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2 and A.6.3.2.2.1.

6.3.2.2.1.4 Test description

6.3.2.2.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.2.1.4.1-1.

Table 6.3.2.2.1.4.1-1: Contention based random access test in FR1 for NR standalone supported test configurations

Test Case ID	Test Config Index	Description
6.3.2.2.1-1	1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.3.2.2.1-2	2	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations		

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.2.1.4.1-2.

Table 6.3.2.2.1.4.1-2: Initial conditions for Contention based random access test in FR1 for NR standalone

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] subclause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 6.3.2.2.1.4.1-1.	
Propagation conditions	AWGN	As specified in Annex C.2.2.

Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.2.2.1.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell). The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.3.2.2.1.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 6.3.2.2.1.5-1.
3. After power-up and cell selection, the UE shall trigger a random access procedure to establish an RRC connection.
4. Test 1: Correct behaviour when transmitting Random Access Preamble

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

5. Test 2: Correct behaviour when receiving Random Access Response

    5.1. Repeat steps 1-3.

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

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

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

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

    5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.1.5.

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

    6.1. Repeat steps 1-3.

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

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

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

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

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.1.5.

7. Test 4: Correct behaviour when receiving a NACK on msg3

7.1. Repeat steps 1-3.

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

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

7.4. The System Simulator shall NACK all UE msg3s.

7.5. The UE shall re-transmit the msg3 until the maximum number of HARQ re-transmissions is reached.

7.6. The System Simulator shall count the UE msg3s, and check that transmission stops when the maximum number of HARQ re-transmissions is reached.

8. Test 5: Correct behaviour when receiving an unsuccessful UE Contention Resolution

8.1. Repeat steps 1-3.

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

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

8.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element not matching the CCCH SDU transmitted in msg3 uplink message.

8.5. As the UE Contention Resolution Identity included in the MAC control element did not match the CCCH SDU transmitted in the uplink message, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

8.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.1.5.

9. Test 6: Correct behaviour when receiving a successful UE Contention Resolution

9.1. Repeat steps 1-3.

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

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

9.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in msg3 uplink message.

9.5. As the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU, the Contention Resolution is successful and the UE shall send ACK.

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

10.1. Repeat steps 1-3.

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

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

10.4. The System Simulator shall not send a response.

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

10.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.1.5.

6.3.2.2.1.4.3 Message contents

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

FFS

6.3.2.2.1.5 Test requirement

Table 6.3.2.2.1.5-1 defines the primary level settings for contention based random access test in FR1 for NR Standalone. Tables 6.3.2.2.1.5-2, 6.3.2.2.1.5-3 and 6.3.2.2.1.5-4 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 6.3.2.2.1.5-1: General test parameters for contention based random access test in FR1 for NR Standalone

Parameter			Unit	Test-1	Comments
SSB Configuration		Config 1		SSB.1 FR1	As defined in A.3.1, except for number of SSBs per SS-burst and SS/PBCH block index as below
		Config 2		SSB.2 FR1	
Number of SSBs per SS-burst				2	Different from the definition in A.3.1
SS/PBCH block index				0,1	Different from the definition in A.3.1
Duplex Mode for Cell 2		Config 1		FDD	
		Config 2		TDD	
TDD Configuration		Config 2		TDDConf.1.2	
OCNG Pattern Note 1				OCNG pattern 1	As defined in A.2.1
PDSCH parameters Note 4		Config 1		SR.1.1 FDD	As defined in A.1.1
		Config 2		SR.2.1 TDD	
NR RF Channel Number				1	
EPRE ratio of PSS to SSS			dB	0	
EPRE ratio of PBCH_DMRS to SSS			dB		
EPRE ratio of PBCH to PBCH_DMRS			dB		
EPRE ratio of PDCCH_DMRS to SSS			dB		
EPRE ratio of PDCCH to PDCCH_DMRS			dB		
EPRE ratio of PDSCH_DMRS to SSS			dB		
EPRE ratio of PDSCH to PDSCH_DMRS			dB		
SSB with index 0	$\hat{E}_s/I_{ot}$		dB	3	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1	dBm/15kHz	-98	
		Config 2		-101	
	$\hat{E}_s/N_{oc}$		dB	3	
	SS-RSRP Note 3		dBm/ SCS	-95	
SSB with index 1	$\hat{E}_s/I_{ot}$		dB	-17	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1	dBm/15kHz	-98	
		Config 2		-101	
	$\hat{E}_s/N_{oc}$		dB	-17	
	SS-RSRP Note 3		dBm/ SCS	-115	
Io Note 2		Config 1	dBm	-65.3/9.36MHz	For symbols without SSB index 1
		Config 2		-62.2/38.16MHz	
ss-PBCH-BlockPower			dBm/ SCS	-5	As defined in clause 6.3.2 in TS 38.331 [13].
Configured UE transmitted power ($P_{\text{CMAX, f,c}}$)			dBm	23	As defined in clause 6.2.4 in TS 38.101-1 [2].
PRACH Configuration				PRACH.1 FR1	As defined in A.7.1.
Propagation Condition			-	AWGN	

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

Test 1: Correct behaviour when transmitting Random Access Preamble

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

Test 2: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be -30 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.1.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

Test 3: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be -30 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.1.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

Test 4: Correct behaviour when receiving a NACK on msg3

- The UE shall re-transmit the msg3 upon the reception of a NACK on msg3 until the maximum number of HARQ retransmission is reached.

Test 5: Correct behaviour when receiving an incorrect message over Temporary C-RNTI

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires.
- The power of the first preamble shall be -30 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.
- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

Test 6: Correct behaviour when receiving a correct message over Temporary C-RNTI

- The UE shall send ACK if the contention resolution is successful.

Test 7: Correct behaviour when contention resolution timer expires

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires if the contention resolution timer expires.
- The power of the first preamble shall be -30 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.
- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

Table 6.3.2.2.1.5-2 Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± 11.1 dB

Table 6.3.2.2.1.5-3 Relative power tolerance Test requirements

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

Table 6.3.2.2.1.5-4: T_e Timing error Test requirements

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

6.3.2.2.2 Non-Contention based random access test in FR1 for NR standalone

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Message contents

- Cell mapping

6.3.2.2.2.1 Test purpose

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

6.3.2.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.3.2.2.2.3 Minimum conformance requirement

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

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

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

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

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

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

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

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

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2 and A.6.3.2.2.2. Non-contention based random access procedure is not initialized for Other SI requested from UE or for beam failure recovery, so the requirements related to those features are omitted.

6.3.2.2.2.4 Test description

6.3.2.2.2.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.2.2.4.1-1.

Table 6.3.2.2.2.4.1-1: Non-Contention based random access test in FR1 for NR standalone supported test configurations

Test Case ID	Test Config Index	Description
6.3.2.2.2-1	1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.3.2.2.2-2	2	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations		

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.2.2.4.1-2.

Table 6.3.2.2.2.4.1-2: Initial conditions for Non-Contention based random access test in FR1 for NR standalone

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] subclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.2.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.2.2.2.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell). The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.3.2.2.2.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink. There are two subtests, to test both SSB-based non-contention based random access (subtest 1) and CSI-RS-based non-contention based random access (subtest 2).

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 6.3.2.2.2.5-1 Subtest 1.

3. After power-up and cell selection, the UE shall trigger a random access procedure to establish an RRC connection.

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

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

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

   5.1. Set the parameters according to Table 6.3.2.2.2.5-1 Subtest 2.

   5.2. Repeat steps 1-3

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

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

   6.1. Repeat steps 1-3

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

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

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

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

   6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.2.5.

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

   7.1. Repeat steps 1-3.

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

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

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

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

7.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.2.5.

6.3.2.2.2.4.3 Message contents

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

FFS

6.3.2.2.2.5 Test requirement

Table 6.3.2.2.2.5-1 defines the primary level settings for non-contention based random access test in FR1 for NR Standalone. Tables 6.3.2.2.2.5-2, 6.3.2.2.2.5-3 and 6.3.2.2.2.5-4 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 6.3.2.2.2.5-1: General test parameters for non-contention based random access test in FR1 for NR Standalone

Parameter			Unit	Subtest 1	Subtest 2	Comments
SSB Configuration	Config 1			SSB pattern 1 in FR1	SSB pattern 1 in FR1	As defined in A.3.1, except for number of SSBs per SS-burst and SS/PBCH block index as below
	Config 2			SSB pattern 2 in FR1	SSB pattern 2 in FR1	
Number of SSBs per SS-burst				2	2	Different from the definition in A.3.1
SS/PBCH block index				0,1	0,1	Different from the definition in A.3.1
CSI-RS Configuration	Config 1			N/A	CSI-RS.1.1 FDD	As defined in A.1.4
	Config 2				CSI-RS.2.1 TDD	
Duplex Mode for Cell 2	Config 1			FDD	FDD	
	Config 2			TDD	TDD	
TDD Configuration	Config 2			TDDConf.1.2	TDDConf.1.2	
OCNG Pattern Note 1				OCNG pattern 1	OCNG pattern 1	As defined in A.2.1.
PDSCH parameters Note 4	Config 1			SR.1.1 FDD	SR.1.1 FDD	As defined in A.1.1.
	Config 2			SR.2.1 TDD	SR.2.1 TDD	
NR RF Channel Number				1	1	
EPRE ratio of PSS to SSS			dB	0	0	
EPRE ratio of PBCH_DMRS to SSS			dB			
EPRE ratio of PBCH to PBCH_DMRS			dB			
EPRE ratio of PDCCH_DMRS to SSS			dB			
EPRE ratio of PDCCH to PDCCH_DMRS			dB			
EPRE ratio of PDSCH_DMRS to SSS			dB			
EPRE ratio of PDSCH to PDSCH_DMRS			dB			
SSB with index 0	$\hat{E}_s/I_{ot}$		dB	3	3	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1	dBm/15kHz	-98	-98	
		Config 2		-101	-101	
	$\hat{E}_s/N_{oc}$		dB	3	3	
	SS-RSRP Note 3		dBm/ SCS	-95	-95	
SSB with index 1	$\hat{E}_s/I_{ot}$		dB	-17	-17	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1	dBm/15kHz	-98	-98	
		Config 2		-101	-101	
	$\hat{E}_s/N_{oc}$		dB	-17	-17	
	SS-RSRP Note 3		dBm/ SCS	-115	-115	
Io Note 2	Config 1		dBm	-65.3/9.36MHz	-65.3/9.36MHz	For symbols without SSB index 1
	Config 2			-62.2/38.16MHz	-62.2/38.16MHz	
ss-PBCH-BlockPower			dBm/ SCS	-5	-5	As defined in clause 6.3.2 in TS 38.331 [13].
Configured UE transmitted power ($P_{\mathrm{CMAX,\ f,c}}$)			dBm	23	23	As defined in clause 6.2.4 in TS 38.101-1 [2].
PRACH Configuration				PRACH.2 FR1	PRACH.3 FR1	As defined in A.7.1.
Propagation Condition			-	AWGN	AWGN	

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

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

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

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

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

Test 3: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be -30 dBm within the accuracy specified in Table 6.3.2.2.2.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.2.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.2.5-4.

Test 4: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be -30 dBm within the accuracy specified in Table 6.3.2.2.2.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.2.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.2.5-4.

Table 6.3.2.2.2.5-2 Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± 11.1 dB

Table 6.3.2.2.2.5-3 Relative power tolerance Test requirements

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

Table 6.3.2.2.2.5-4: T_e Timing error Test requirements

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

6.3.2.3 RRC connection release with redirection

6.4 Timing

6.4.1 UE transmit timing

6.4.2 UE timer accuracy

6.4.3 Timing advance

6.4.3.0 Minimum conformance requirement

6.4.3.0.1 Minimum conformance requirement for timing advance adjustment

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 6.4.3.1.3-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS38.213 [8].

Table 6.4.3.1.3-1: UE Timing Advance adjustment accuracy

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

6.4.3.1 NR SA FR1 timing advance adjustment accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Connection diagram is TBD

-Initial Conditions has some TBD

-Test Requirement has some TBD

- Message Exceptions is FFS

6.4.3.1.1 Test purpose

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

6.4.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.4.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.4.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.4.3.1.

6.4.3.1.4 Test description

6.4.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table [5.3.5-1] and Table [5.3.6-1] of 38.521-1 [17].

This test shall be tested using any of the test configurations in Table 6.4.3.1.4.1-1.

Table 6.4.3.1.4.1-1: NA SA FR1 timing advance adjustment accuracy supported test configurations

Config	Description
1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.4.3.1.4.1-2

Table 6.4.3.1.4.1-2: Initial conditions for EN-DC FR1 timing advance adjustment accuracy

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.4.3.1.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

Table 6.4.3.1.4.1-3: General test parameters for timing advance

Parameter	Unit	Value	Comment
RF channel number		1	
DL BWP		DLBWP.1.1	As specified in Table A.3.9.2.1-1
UL BWP		ULBWP.1.1	As specified in Table A.3.9.2.2-1
TRS		TBD	TBD
Timing Advance Command (T_A) value during T1		31	$N_{TA\_new} = N_{TA\_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2
Timing Advance Command (T_A) value during T2		39	$N_{TA\_new} = N_{TA\_old} + 8192*T_c$ (based on equation in TS38.213 section 4.2)
T1	s	5	
T2	s	5	

1. Message contents are defined in clause 6.4.3.1.4.3.
2. Single Cell is used, which is NR FR1 Pcell. The power levels and settings are set according to Annex TBD, Table TBD. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2
3. The test parameters are given in Table 6.4.3.1.4.1-3 above.

4. Downlink signals for NR cell are initially set up according to Annex [C.0], [C.1], [C.2], [C.3.1] and uplink signals according to Annex [G.0], [G.1], [G.2], [G.3.1].

5. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [10] clause 4.5. Message content are defined in clause 6.4.3.1.2.3.

6.4.3.1.4.2 Test Procedure

The test consists of single cell. The test consists of two successive time periods, with time durations of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and Sounding Reference Signals (SRS), as specified in table 6.4.3.1.5-1, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured. The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321, shall be configured so that it does not expire in the duration of the test.

1. Set the parameters according to values in Tables 6.4.3.1.4.1-3. Propagation conditions are set according to Annex [TBD].

2. SS shall transmit an RRCReconfiguration message.

3. The UE shall transmit RRCReconfigurationComplete message.

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

5. During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value 39 as specified in table 6.4.3.1.4.1-3. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

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

7. The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321, shall be configured so that it does not expire in the duration of the test.

8. The result from the SRS and adjustment of the timing advance in step 7) is used to measure that the UE adjusts the timing of its transmission with a relative accuracy better than or equal to value specified in Table 6.4.3.1.3-1 to the signalled timing advance value compared to the timing of preceding uplink transmission.

9. If the UE adjust the timing of its transmission within a relative accuracy greater than or equal to value specified in Table 6.4.3.1.3-1 to the signalled timing advance value compared to the timing of preceding uplink transmission then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

10. The SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

11. After the RRC connection release, the SS:

[transmits in Cell a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE is in State RRC_CONNECTED according to [TS 38.508-1] [14] clause 4.5.4 (if the paging fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED according to [TS 38.508-1] [14] clause 4.5.4)],

or

[if the paging fails, switch off and on the UE and ensure the UE in RRC_CONNECTED according to [TS 38.508-1] [14] clause 4.5.4)].

12. Repeat step 2-11 until the confidence level according to Tables [G.2.3-1] in Annex [G] clause [G.2] is achieved.

6.4.3.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1.

Table xx: message exceptions for SA

FFS

6.4.3.1.5 Test Requirement

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

k = 4 for Config 1, 2, and

k = 7 for Config 3

The Timing Advance adjustment accuracy shall be within the limits specified in Table 6.4.3.1.3-1.

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

Table 6.4.3.1.5-1 and Table 6.4.3.1.5-2 define the primary level settings.

Table 6.4.3.1.5-1: Cell specific test parameters for timing advance

Parameter	Unit	Test1	
		T1	T2

Duplex mode	Config 1		FDD
	Config 2,3		TDD
TDD configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52
	Config 2		10: $N_{RB,c}$ = 52
	Config 3		40: $N_{RB,c}$ = 106
BWP BW	Config 1	MHz	10: $N_{RB,c}$ = 52
	Config 2		10: $N_{RB,c}$ = 52
	Config 3		40: $N_{RB,c}$ = 106
DRx Cycle		ms	Not Applicable
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD
	Config 2		SR.1.1 TDD
	Config 3		SR2.1 TDD
CORESET Reference Channel	Config 1		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR2.1 TDD
OCNG Patterns			OCNG pattern 1
SMTC configuration	Config 1,2		SMTC.1 FR1
	Config 3		SMTC.2 FR1
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz
	Config 3		30 kHz
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz
	Config 3		30 kHz
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
N_{oc} Note2		dBm/15kHz	-98
N_{oc} Note2	Config 1,2	dBm/SCS	-98
	Config 3		-95
$\hat{E}_s/I_{ot}$		dB	3
$\hat{E}_s/N_{oc}$		dB	3
Io Note3	Config 1,2	dBm/ 9.36MHz	-67.57
	Config 3	dBm/ 38.16MHz	-62.58
Propagation condition		-	AWGN

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.4.3.1.5-2: Sounding Reference Symbol Configuration for timing advance

Field		Value	Comment
c-SRS	Config 1,2	12	Frequency hopping is disabled
	Config 3	24	
b-SRS		0	
b-hop		0	
freqDomainPosition		0	Frequency domain position of SRS
freqDomainShift		0	
groupOrSequenceHopping		neither	No group or sequence hopping
SRS-PeriodicityAndOffset		sl5=0	Once every 5 slots
pathlossReferenceRS		ssb-Index=0	SSB #0 is used for SRS path loss estimation
usage		nonCodebook	Non-codebook based UL transmission
startPosition		0	resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition.
nrofSymbols		n1	
repetitionFactor		n1	
combOffset-n2		0	transmissionComb setting
cyclicShift-n2		0	
nrofSRS-Ports		port1	Number of antenna ports used for SRS transmission
Note: For further information see clause 6.3.2 in TS 38.331.			

6.5 Signaling characteristics

6.5.1 Radio link monitoring

The UE shall monitor the downlink link quality based on the reference signal in the configured RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell and PCell as specified in [3]. The configured RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP.

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

The threshold Q_{out} is defined as the level at which the downlink radio link cannot be reliably received and shall correspond to the out-of-sync block error rate ($BLER_{out}$) as defined in Table 6.5.1-1. For SSB based radio link monitoring, Q_{out_SSB} is derived based on the hypothetical PDCCH transmission parameters listed in Table 6.5.1.1.4.1-3. For CSI-RS based radio link monitoring, Q_{out_CSI-RS} is derived based on the hypothetical PDCCH transmission parameters listed in Table [4.x.x.x-x].

The threshold Q_{in} is defined as the level at which the downlink radio link quality can be significantly more reliably received than at Q_{out} and shall correspond to the in-sync block error rate ($BLER_{in}$) as defined in Table 6.5.1-1. For SSB based radio link monitoring, Q_{in_SSB} is derived based on the hypothetical PDCCH transmission parameters listed in Table 6.5.1.1.4.1-3. For CSI-RS based radio link monitoring, Q_{in_CSI-RS} is derived based on the hypothetical PDCCH transmission parameters listed in Table [4.x.x.x-x]

The out-of-sync block error rate ($BLER_{out}$) and in-sync block error rate ($BLER_{in}$) are determined from the network configuration via parameter *rlmInSyncOutOfSyncThreshold* signalled by higher layers. When UE is not configured with *RLM-IS-OOS-thresholdConfig* from the network, UE determines out-of-sync and in-sync block error rates from

Configuration #0 in Table 6.5.1-1 as default. All requirements here are applicable for BLER Configuration #0 in Table 6.5.1-1.

Table 6.5.1-1: Out-of-sync and in-sync block error rates

Configuration	$BLER_{out}$	$BLER_{in}$
0	10%	2%

UE shall be able to monitor up to X_{RLM-RS} RLM-RS resources of the same or different types in each corresponding carrier frequency range, where X_{RLM-RS} is specified in Table 6.5.1-2, and meet the requirements as specified in this section.

Table 6.5.1-2: Maximum number of RLM-RS resources X_{RLM-RS}

Maximum number of RLM-RS resources, X_{RLM-RS}	Carrier frequency range of PCell/Pcell
2	FR1, ≤ 3 GHz
4	FR1, > 3 GHz
8	FR2

If different SCS is used for CSI-RS based RLM-RS and SSB, then CSI-RS based RLM-RS and SSB shall be TDMed. If same SCS is used for CSI-RS based RLM-RS and SSB, then CSI-RS based RLM-RS and SSB can be FDMed or TDMed.

Any uplink signal transmitted by the UE is used for detecting the In-/Out-of-Sync state of the UE. In terms of measurement, the uplink signal is verified on the basis of the UE output power:

For intra-band contiguous carrier aggregation, transmit OFF power is measured as the mean power per component carrier.

For UE with multiple transmit antennas, transmit OFF power is measured as the mean power at each transmit connector.

- UE output power higher than Transmit OFF power [-50] dBm (as defined in TS 38.101-3 [TBD]) means uplink signal
- UE output power equal to or less than Transmit OFF power [-50] dBm (as defined in TS 38.101-3 [TBD]) means no uplink signal.

6.5.1.0 Minimum conformance requirements

6.5.1.0.1 Minimum conformance requirements for out-of-sync SSB-based RLM

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate\_out\_SSB}$ [ms] period becomes worse than the threshold Q_{out_SSB} within $T_{Evaluate\_out\_SSB}$ [ms] evaluation period. The requirements in this section apply for each SSB based RLM-RS resource configured for PSCell, provided that the SSB configured for RLM is transmitted within UE active DL BWP during the entire evaluation period defined in Table 6.5.1.0.1-1.

$T_{Evaluate\_out\_SSB}$ is defined in Table 6.5.1.0.1-1 for FR1.

Table 6.5.1.0.1-1: Evaluation period $T_{Evaluate\_out}$ for FR1

Configuration	$T_{Evaluate\_out\_SSB}$ (ms)
no DRX	$\max(200,\text{ceil}(10*P)*T_{SSB})$
DRX cycle≤320	$\max(200,\text{ceil}(15*P)*\max(T_{DRX},T_{SSB}))$
DRX cycle>320	$\text{ceil}(10*P)*T_{DRX}$
NOTE: T_{SSB} is the periodicity of SSB configured for RLM.	

For FR1,

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

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

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

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

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

The out-of-sync and in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [8]. Two successive indications from Layer 1 shall be separated by at least $T_{Indication\_interval}$.

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

When

- the UE transitions from a first configuration of RLM-RS resources to a second configuration of RLM-RS resources that is different from the first configuration,

or

- the UE transitions between DRX and no DRX or DRX cycle periodicity changes,

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

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

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

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

There are no scheduling restrictions due to radio link monitoring performed with a same subcarrier spacing as PDSCH/PDCCH on FR1.

For UE which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to radio link monitoring based on SSB as RLM-RS. For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [11] the following restrictions apply due to radio link monitoring based on SSB as RLM-RS.

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on SSB symbols to be measured for radio link monitoring.

The normative reference for this requirement is TS 38.133 [6] clauses 8.1.2, 8.1.4, 8.1.5, 8.1.6 and 8.1.7.

6.5.1.0.2 Minimum conformance requirements for in-sync SSB-based RLM

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

$T_{Evaluate\_out\_SSB}$ and $T_{Evaluate\_in\_SSB}$ are defined in Table 6.5.1.0.2-1 for FR1.

For FR1,

- P=1/(1 – T_{SSB}/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

If the high layer in TS 38.331 [2] signaling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

Note: The overlap between CSI-RS RLM and SMTC means that CSI-RS based RLM is within the SMTC window duration.Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

The values of M_{out} and M_{in} used in Table 6.5.1.2.3-1 are defined as:

- M_{out} = 20 and M_{in} = 10, if the CSI-RS resource configured for RLM is transmitted with Density =3.

Table 6.5.1.0.2-1: Evaluation period $T_{Evaluate\_out}$ and $T_{Evaluate\_in}$ for FR1

Configuration	$T_{Evaluate\_out}$ (ms)	$T_{Evaluate\_in}$ (ms)
no DRX	max(200, ceil(M_{out}×P)×T_{CSI-RS})	max(100, ceil(M_{in}×P) × T_{CSI-RS})
DRX ≤ 320ms	max(200, ceil(1.5×M_{out}×P)× max(T_{DRX}, T_{CSI-RS}))	max(100, ceil(1.5×M_{in}×P)× max(T_{DRX}, T_{CSI-RS}))
DRX > 320ms	ceil(M_{out}×P) × T_{DRX}	ceil(M_{in}×P) × T_{DRX}
NOTE: T_{CSI-RS} is the periodicity of CSI-RS resource configured for RLM. T_{DRX} is the DRX cycle length.		

If the high layer in TS 38.331 [2] signaling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than Q_{in}, Layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [2].

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

When DRX is not used $T_{Indication\_interval}$ is max(10ms, $T_{RLM-RS,M}$), where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to T_{SSB} specified in section 8.1.2 of TS 38.133 [6] if the RLM-RS resource is SSB, or T_{CSI-RS} specified later in this if the RLM-RS resource is CSI-RS.

When DRX is used, TIndication_interval is max(10ms, 1.5*DRX_cycle_length, 1.5*TRLM-RS,M) if DRX cycle_length is less than or equal to 320ms, and TIndication_interval is DRX_cycle_length if DRX cycle_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [2], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

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

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

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

There are no scheduling restrictions due to radio link monitoring performed with a same subcarrier spacing as PDSCH/PDCCH on FR1.

For UE which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to radio link monitoring based on SSB as RLM-RS. For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [11] the following restrictions apply due to radio link monitoring based on SSB as RLM-RS.

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on SSB symbols to be measured for radio link monitoring.

The normative reference for this requirement is TS 38.133 [6] clauses 8.1.2, 8.1.4, 8.1.5, 8.1.6, 8.1.7 and A.7.5.1.

6.5.1.0.3 Minimum conformance requirements for out-of-sync and in-sync CSI-RS based RLM

[TS 38.133 clause 8.1.3.2]

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

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

- $T_{Evaluate\_out\_CSI-RS}$ and $T_{Evaluate\_in\_CSI-RS}$ are defined in Table 8.1.3.2-1 for FR1.

For FR1,

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

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

If the high layer in TS 38.331 [2] signaling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

Note: The overlap between CSI-RS RLM and SMTC means that CSI-RS based RLM is within the SMTC window duration. Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

The values of M_{out} and M_{in} used in Table 8.1.3.2-1 are defined as:

- M_{out} = 20 and M_{in} = 10, if the CSI-RS resource configured for RLM is transmitted with Density =3.

Table 6.5.1.0.3-1: Evaluation period $T_{Evaluate\_out}$ and $T_{Evaluate\_in}$ for FR1

Configuration	$T_{Evaluate\_out}$ (ms)	$T_{Evaluate\_in}$ (ms)
no DRX	max(200, ceil(M_{out}×P)×T_{CSI-RS})	max(100, ceil(M_{in}×P) × T_{CSI-RS})
DRX ≤ 320ms	max(200, ceil(1.5×M_{out}×P)× max(T_{DRX}, T_{CSI-RS}))	max(100, ceil(1.5×M_{in}×P)× max(T_{DRX}, T_{CSI-RS}))
DRX > 320ms	ceil(M_{out}×P) × T_{DRX}	ceil(M_{in}×P) × T_{DRX}
NOTE: T_{CSI-RS} is the periodicity of CSI-RS resource configured for RLM. T_{DRX} is the DRX cycle length.		

[TS 38.133 clause 8.1.6]

When the downlink radio link quality on all the configured RLM-RS resources is worse than Q_{out}, Layer 1 of the UE shall send an out-of-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 38.331 [2].

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than Q_{in}, Layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [2].

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

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

In case DRX is used, $T_{Indication\_interval}$ is max(10ms, 1.5*DRX_cycle_length, 1.5*$T_{RLM-RS,M}$) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication\_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [2], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

[TS 38.133 clause 8.1.5]

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331 [2].

The normative reference for this requirement is TS 38.133 [6] clause 8.1.3.2, 8.1.6 and 8.1.5.

6.5.1.1 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Connection diagram is TBD

-Initial Conditions has some TBD

-Test Requirement has some TBD

- Message Exceptions is FFS

6.5.1.1.1 Test purpose

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

6.5.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.5.1.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.1.

6.5.1.1.4 Test description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 6.5.1.1.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [5] ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 2.

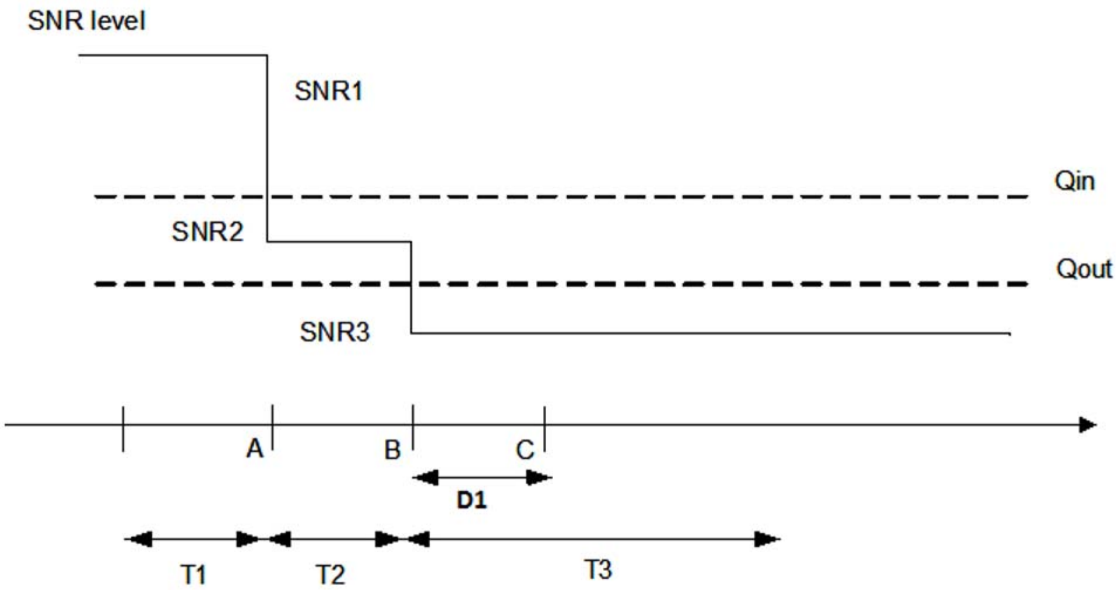


Figure 6.5.1.1.4-1: SNR variation for out-of-sync testing

6.5.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table [5.3.5-1] and Table [5.3.6-1] of 38.521-1 [17].

This test shall be tested using any of the test configurations in Table 6.5.1.1.4.1-1.

Table 6.5.1.1.4.1-1: NA SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode supported test configurations

Configuration	Description
1	FDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz
2	TDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz
3	TDD, SSB SCS 30 KHz, data SCS 30KHz, BW 40MHz
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.1.4.1-2

Table 6.5.1.1.4.1-2: Initial conditions for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.1.1.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

PDCCH transmission parameters are given in Table 6.5.1.1.4.1-3

Table 6.5.1.1.4.1-3: PDCCH transmission parameters for out-of-sync

Attribute	Value for BLER Configuration #0
DCI format	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	8
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	4dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	4dB
Bandwidth (MHz)	TBD
Sub-carrier spacing (kHz)	TBD
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

1. Message contents are defined in clause 6.5.1.1.4.3.
2. The power levels and settings for Cell are set according to Annex TBD, Table TBD . The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2
3. The test parameters are given in Table 6.5.1.1.4.1-4 below.
4. Downlink signals for NR cell are initially set up according to Annex [C.0], [C.1], [C.2], [C.3.1] and uplink signals according to Annex [G.0], [G.1], [G.2], [G.3.1].

5. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [10] clause 4.5.

Table 6.5.1.1.4.1-4: General test parameters for FR1 out-of-sync testing in non-DRX mode

Parameter		Unit	Value	
			Test 1	Test 2
Active PCell			Cell 1	Cell 1
RF Channel Number			1	1
Duplex mode	Config 1		FDD	FDD
	Config 2, 3		TDD	TDD
TDD Configuration	Config 1		Not Applicable	Not Applicable
	Config 2		[TDDConf.1.1]	[TDDConf.1.1]
	Config 3		[TDDConf.1.2]	[TDDConf.1.2]
CORESET Reference Channel	Config 1		[CR. 1.1 FDD]	[CR. 1.1 FDD]
	Config 2		[CR. 1.1 TDD]	[CR. 1.1 TDD]
	Config 3		[CR. 2.1 TDD]	[CR. 2.1 TDD]
SSB Configuration	Config 1		Table A.3.2.2.1.1-1	Table A.3.2.2.1.1-1
	Config 2		Table A.3.2.2.1.1-1	Table A.3.2.2.1.1-1
	Config 3		Table A.3.2.2.1.2-1	Table A.3.2.2.1.2-1
SMTC Configuration	Config 1, 2		Table A.3.2.3.1-1	Table A.3.2.3.1-1
	Config 3		Table A.3.2.3.1-1	Table A.3.2.3.1-1
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 KHz	15 KHz
	Config 3		30 KHz	30 KHz
PRACH Configuration	Config 1, 2		TBD	TBD
	Config 3		TBD	TBD
SSB index assigned as RLM RS			[0]	[0]
OCNG parameters			Table A.3.2.1.1-1	Table A.3.2.1.1-1
CP length			Normal	Normal
Correlation Matrix and Antenna Configuration			[2x2 Low]	[2x2 Low]
Out of sync transmission parameters	DCI format		1-0	1-0
	Number of Control OFDM symbols		2	2
	Aggregation level	CCE	8	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4	4
	DMRS precoder granularity		REG bundle size	REG bundle size
	REG bundle size		6	6
DRX			*OFF*	*OFF*
Gap pattern ID			[N.A.]	*[*gp0*]*
Layer 3 filtering			*Enabled*	*Enabled*
T310 timer		ms	*0*	*0*
T311 timer		ms	1000	1000
N310			1	1
N311			1	1
NZP CSI-RS configuration			TBD	TBD
ZP CSI-RS configuation			TBD	TBD
CSI-IM configuration			TBD	TBD
Periodic CSI reporting			PUCCH	PUCCH
CSI reporting periodicity	Config 1, 2	slot	[5]	[5]
	Config 3		[10]	[10]
T1		s	1	1

T2	s	0.4	0.4
T3	s	[0.6]	[0.6]
D1	s	[0.24]	[0.44]
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.			

6.5.1.1.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 1] with a reporting periodicity as mentioned in the above table 6.5.1.1.4.1-4.

1. Set the parameters according to T1 in Table 6.5.1.1.4.4-1 for subtest 1 and 2. Propagation conditions are set according to Annex TBD. T1 starts.

2. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.1.4.4-1 for subtests 1 and 2. T2 starts.

3. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.1.4.4-1 for subtests 1 and 2. T3 starts.

4. If the SS:

   a) detects uplink power equal to or higher than [-50 dBm] in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 1]) during the period from time point A to time point B

   and

   b) does not detect any uplink power higher than [-50 dBm] from time point C (240 ms after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

5. Otherwise the number of failed tests is increased by one.

6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 6.5.1.1.4.4-1 for subtests 1 and 2.

7. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [10] clause 4.5.

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

6.5.1.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1.

Table xx: message exceptions for SA

FFS

6.5.1.1.5 Test Requirement

Table 6.5.1.1.5-1 defines the cell specific primary level settings.

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

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

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

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

Table 6.5.1.1.5-1: Cell specific test parameters for FR1 (Cell 2) for out-of-sync radio link monitoring tests in non-DRX mode

Parameter		Unit	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
PDCCH_beta		dB	4			4		
PDCCH_DMRS_beta		dB	4			4		
PBCH_beta		dB	0			0		
PSS_beta		dB						
SSS_beta		dB						
PDSCH_beta		dB						
OCNG_beta		dB						
SNR	Config 1	dB	[1]	[-7]	[-15]	[1]	[-7]	[-15]
	Config 2		[1]TBD	[-7]	[-15]	[1]	[-7]	[-15]
	Config 3		[1]TBD	[-7]	[-15]	[1]	[-7]	[-15]
N_{oc}	Config 1	dBm/15KHz	[-98]			[-98]		
	Config 2		[-98]			[-98]		
	Config 3		[-98]			[-98]		
Propagation condition			[TDL-C 300ns 100Hz]			[TDL-C 300ns 100Hz]		

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 6.5.1.1.4-1.
Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table 6.5.1.1.5-2: Measurement gap configuration for out-of-sync tests in non-DRX mode

Field	Test 2
	Value
gapOffset	[0]
Note Ensure that RLM RS is partially overlapped with measurement gap	

6.5.1.2 NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode

Editor's Notes: This test case is incomplete. The following aspects are either missing or not yet determined

- Initial Conditions has some TBD due to Annexes still being in formative stage.
- Test tolerance analysis is TBD
- Exceptions to Message contents are TBD
- Cell mapping is TBD
- Connection diagram is TBD
- whether to revise the SSB configuration to be 2 SSBs and FFS the corresponding power level

6.5.1.2.1 Test purpose

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

6.5.1.2.2 Test applicability

This test applies to all types of NR UEs supporting Release 15 and forwared

6.5.1.2.3 Minimum conformance requirements

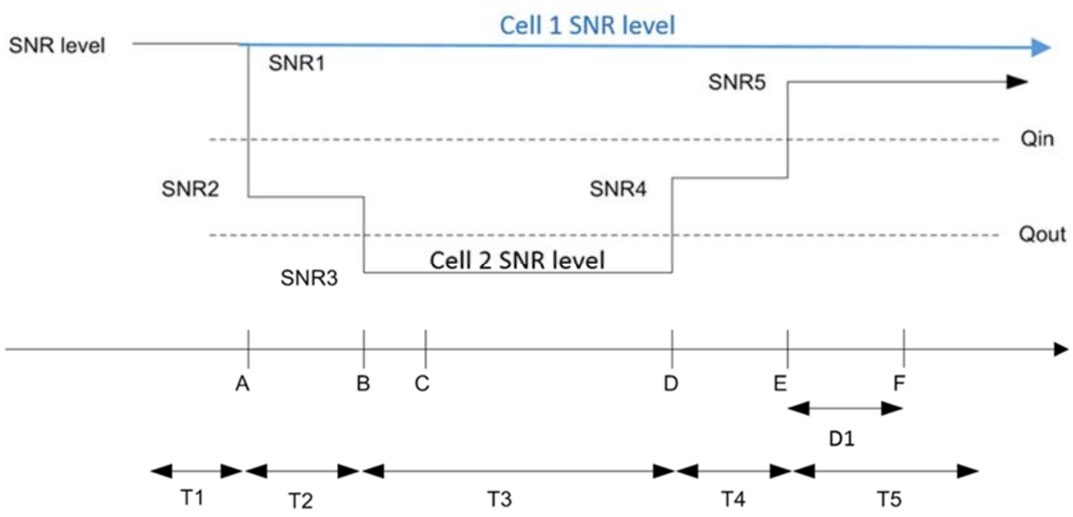
The minimum conformance requirements are specified in clause 6.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.2.

6.5.1.2.4 Test Description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.6.5.1.3.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [5] ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 2.

Table 6.5.1.2.4-1 - SNR variation for in-sync testing



6.5.1.2.5 Test Requirements

6.5.1.2.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table [5.3.5-1] and Table [5.3.6-1] of 38.521-1 [17].

This test shall be tested using any of the test configurations in Table 6.5.1.2.4.1-1.

Table 6.5.1.2.4.1-1: Supported test configurations for FR1 PSCell

Configuration	Description
1	FDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz
2	TDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz
3	TDD, SSB SCS 30 KHz, data SCS 30KHz, BW 40MHz
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.2.4.1-2

Table 6.5.1.2.4.1-2: Initial conditions for SA FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.1.2.5-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

PDCCH transmission parameters are given in Table 6.5.1.2.4.1-3

Table 6.5.1.2.4.1-3: PDCCH transmission parameters for in-sync

Attribute	Value for BLER Configuration #0
DCI payload size	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	4
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	0dB
Bandwidth (MHz)	TBD
Sub-carrier spacing (kHz)	TBD
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

1. Message contents are defined in clause 4.5.1.3.4.3.

2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2

3. The general test parameters are given in Table 6.5.1.2.5-4 below.

4. Downlink signals for NR cell are initially set up according to Annex [C.0], [C.1], [C.2], [C.3.1] and uplink signals according to Annex [G.0], [G.1], [G.2], [G.3.1].

Table 6.5.1.2.4.1-4: General test parameters for FR1 in-sync testing in non-DRX mode

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52
	Config 2		10: $N_{RB,c}$ = 52
	Config 3		40: $N_{RB,c}$ = 106
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
TDD Configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
CORESET Reference Channel	Config 1		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 KHz
	Config 3		30 KHz
PRACH Configuration	Config 1, 2		Table A.3.8.2.4-1
	Config 3		Table A.3.8.2.4-1
SSB index assigned as RLM RS			0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			*OFF*

Gap pattern ID			N.A.
Layer 3 filtering			*Enabled*
T310 timer		ms	2000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		[CSI-RS.1.3 FDD]
	Config 2		[CSI-RS.1.3 TDD]
	Config 3		[CSI-RS.2.3 TDD]
T1		s	0.5
T2		s	0.4
T3		s	1.46
T4		s	0.4
T5		s	1
D1		s	0.42
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.			

6.5.1.2.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.1.4.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states.. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 1] with a reporting periodicity as mentioned in the above table 4.5.1.4.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* according to TS 38.508-1 [6] clause 4.5.

2. Set the parameters according to T1 in Table 4.5.1.4.4-1 for subtest 1 and 2. Propagation conditions are set according to Annex TBD. T1 starts.

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

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

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

6. When T4 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.4.5-1. T5 starts.

7. If the SS detects uplink power equal to or higher than -39 dBm in the On-duration part of every DRX cycle in the subframe according the configured CQI reporting mode (PUCCH 1-0) during the period from time point A to time point F (1120 ms after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

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

6.5.1.2.4.3 Message Contents

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

Table 6.5.1.2.4.3-1: Common Exception messages for SA FR1 Radio Link Monitoring In-Sync Test for FR1 PSCell configured with SSB-based RLM RS in non-DRX mode

TBD

6.5.1.2.5 Test Requirement

The requirements in this section apply for each SSB based RLM-RS resource configured for the PCell, provided that the SSB configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in section 6.5.1.2.3.

Table 6.5.1.2.5-1 defines the cell specific primary level settings.

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

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

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

Table A.6.5.1.2.5-1: Cell specific test parameters for FR1 for in-sync radio link monitoring tests in non-DRX mode

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	4				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0				
EPRE ratio of PBCH DMRS to SSS		dB	0				
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR	Config 1	dB	1	-7	-15	-4.5	1
	Config 2		1	-7	-15	-4.5	1
	Config 3		1	-7	-15	-4.5	1
N_{oc}	Config 1	dBm/ 15 KHz	-98				
	Config 2		-98				
	Config 3		-98				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.6.5.1.2.1-1.
Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in section A.3.6.

6.5.1.3 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in DRX mode

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Connection diagram is TBD

-Initial Conditions has some TBD

-Test Requirement has some TBD

- Message Exceptions is FFS

6.5.1.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the PCell configured with SSB-based RLM RS when DRX is used. This test will partly verify the NR cell radio link monitoring requirements in TS 38.133 [6] section 8.1.2.

6.5.1.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.5.1.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.3.

6.5.1.3.4 Test description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.6.5.1.3.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [5] ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 2.

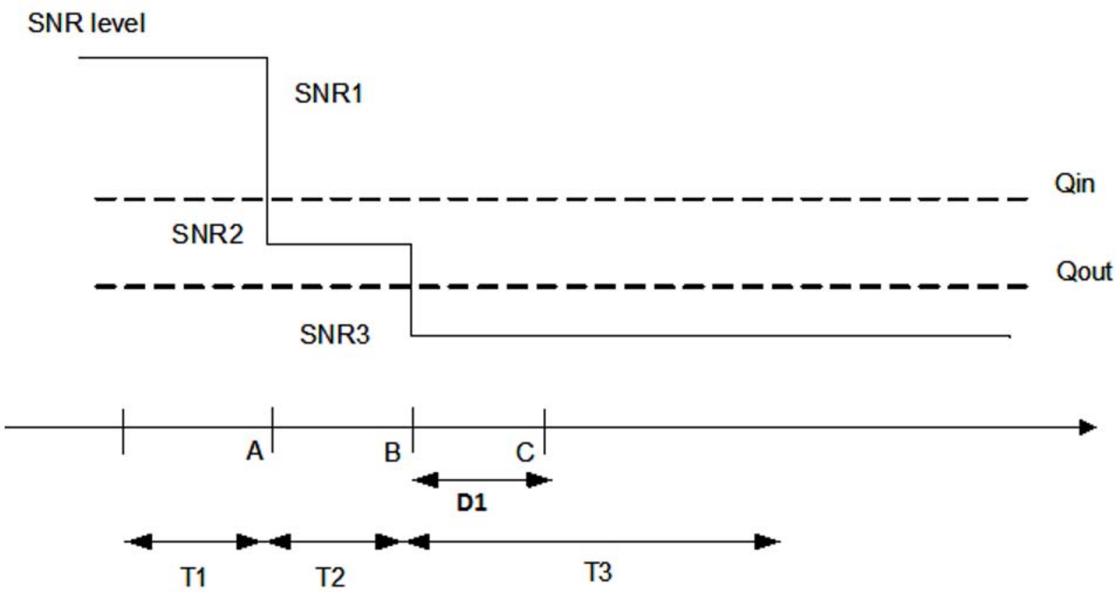


Figure 6.5.1.3.4-1: SNR variation for out-of-sync testing

6.5.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table [5.3.5-1] and Table [5.3.6-1] of 38.521-1 [17].

This test shall be tested using any of the test configurations in Table 6.5.1.3.4.1-1.

Table 6.5.1.3.4.1-1: NA SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in DRX mode supported test configurations

Configuration	Description
1	FDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz
2	TDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz
3	TDD, SSB SCS 30 KHz, data SCS 30KHz, BW 40MHz
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.3.4.1-2

Table 6.5.1.3.4.1-2: Initial conditions for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.1.3.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

PDCCH transmission parameters are given in Table 6.5.1.3.4.1-3

Table 6.5.1.3.4.1-3: PDCCH transmission parameters for out-of-sync

Attribute	Value for BLER Configuration #0
DCI format	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	8
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	4dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	4dB
Bandwidth (MHz)	TBD
Sub-carrier spacing (kHz)	TBD
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

1. Message contents are defined in clause 6.5.1.3.4.3.

2. Single Cell is used, which is NR FR1 Pcell. The power levels and settings are set according to Annex TBD, Table TBD. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2

3. The test parameters are given in Table 6.5.1.3.4.1-4 below.

4. Downlink signals for NR cell are initially set up according to Annex [C.0], [C.1], [C.2], [C.3.1] and uplink signals according to Annex [G.0], [G.1], [G.2], [G.3.1].

5. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [10] clause 4.5.

Table 6.5.1.3.4.1-4: General test parameters for FR1 out-of-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
Active Pcell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
TDD Configuration	Config 1		Not Applicable
	Config 2		[TDDConf.1.1]
	Config 3		[TDDConf.1.2]
CORESET Reference Channel	Config 1		[CR. 1.1 FDD]
	Config 2		[CR. 1.1 TDD]
	Config 3		[CR. 2.1 TDD]
SSB Configuration	Config 1		Table A.3.2.2.1.1-1
	Config 2		Table A.3.2.2.1.1-1
	Config 3		Table A.3.2.2.1.2-1
SMTC Configuration	Config 1, 2		Table A.3.2.3.1-1
	Config 3		Table A.3.2.3.1-1
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 KHz
	Config 3		30 KHz
PRACH Configuration	Config 1, 2		TBD
	Config 3		TBD
SSB index assigned as RLM RS			[0]
OCNG parameters			Table A.3.2.1.1-1
CP length			Normal
Correlation Matrix and Antenna Configuration			[2x2 Low]
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX cycle		ms	640
Gap pattern ID			[N.A.]
Layer 3 filtering			*Enabled*
T310 timer		ms	*0*
T311 timer		ms	1000
N310			1
N311			1
NZP CSI-RS configuration			TBD
ZP CSI-RS configuration			TBD
CSI-IM configuration			TBD
Periodic CSI reporting			PUCCH
CSI reporting periodicity	Config 1, 2	slot	[5]
	Config 3		[10]
T1		s	1
T2		s	0.4
T3		s	[7]
D1		s	[6.44]
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.			

6.5.1.3.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 1] with a reporting periodicity as mentioned in the above table 6.5.1.3.4.1-4.

1. Set the parameters according to T1 in Table 6.5.1.3.4.4-1 for subtest 1. Propagation conditions are set according to Annex TBD. T1 starts.
2. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.3.4.4-1 for subtests 1 and 2. T2 starts.
3. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.3.4.4-1 for subtests 1 and 2. T3 starts.
4. If the SS:

    a) detects uplink power equal to or higher than [-50 dBm] in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 1]) during the period from time point A to time point B

    and

    b) does not detect any uplink power higher than [-50 dBm] from time point C (240 ms after the start of T3) until T3 expires,

    the number of successful tests is increased by one.

    Otherwise the number of failed tests is increased by one.

5. When T3 expires the SS shall change the SNR value to T1 as specified in Table 6.5.1.3.4.4-1 for subtests 1 and 2.
6. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [10] clause 4.5.
7. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.5.1.3.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1.

Table xx: message exceptions for SA

FFS

6.5.1.3.5 Test Requirement

Table 6.5.1.3.5-1 defines the cell specific primary level settings.

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

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

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

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

Table 6.5.1.3.5-1: Cell specific test parameters for FR1 (Cell 1) for out-of-sync radio link monitoring tests in DRX mode

Parameter		Unit	Test 1		
			T1	T2	T3
PDCCH_beta		dB	4		
PDCCH_DMRS_beta		dB	4		
PBCH_beta		dB	0		
PSS_beta		dB			
SSS_beta		dB			
PDSCH_beta		dB			
OCNG_beta		dB			
SNR	Config 1	dB	[1]	[-7]	[-15]
	Config 2		[1]	[-7]	[-15]
	Config 3		[1]	[-7]	[-15]
N_{oc}	Config 1	dBm/15 KHz	[-98]		
	Config 2		[-98]		
	Config 3		[-98]		
Propagation condition			[TDL-C 300ns 100Hz]		

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 6.5.1.3.4-1.
Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table 6.5.1.3.5-2: DRX-Configuration for out-of-sync tests

Field	Test 1
	Value
drx-onDurationTimer	[ms6]
drx-InactivityTimer	[ms1]
drx-RetransmissionTimerDL	[sl1]
drx-RetransmissionTimerUL	[sl1]
longDRX-CycleStartOffset	[ms640]
shortDRX	Disable

Table 6.5.1.3.5-3: DRX-Configuration for out-of-sync tests.

Field		Test 1
		Value
TimeAlignmentTimer		infinity
periodicityAndOffset in SchedulingRequestResourceConfig	Config 1, 2	[sl5]
	Config 3	[sl10]

6.5.1.4 NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in DRX mode

Editor's Notes: This test case is incomplete. The following aspects are either missing or not yet determined

- Initial Conditions has some TBD due to Annexes still being in formative stage.

- Test tolerance analysis is TBD

- Exceptions to Message contents are TBD

- Cell mapping is TBD

- Connection diagram is TBD
- whether to revise the SSB configuration to be 2 SSBs and FFS the corresponding power level

6.5.1.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects in sync for the purpose of monitoring downlink radio link quality of the Pcell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.2.

6.5.1.4.2 Test applicability

This test applies to all types of NR UEs supporting Release 15 and forward

6.5.1.4.3 Minimum conformance requirements

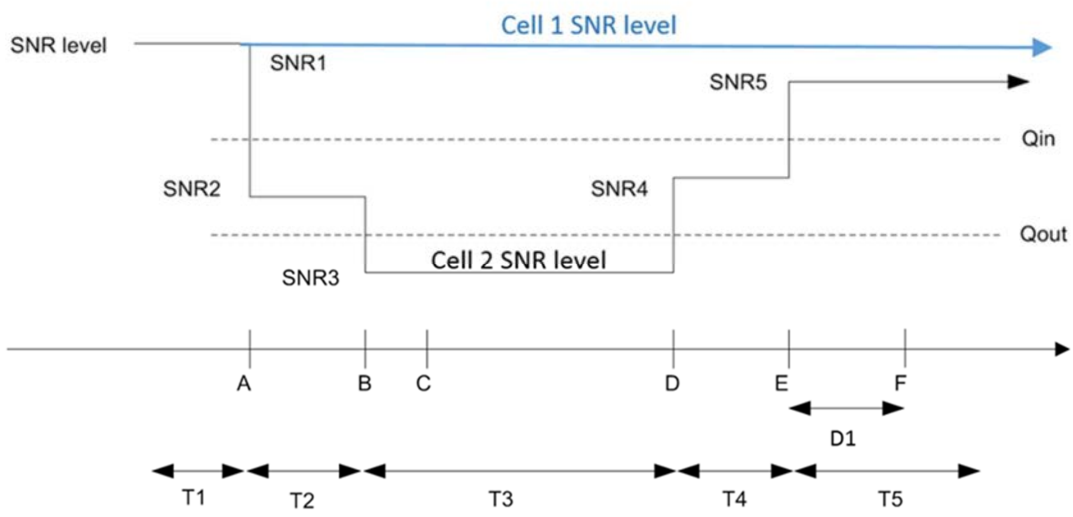
The minimum conformance requirements are specified in clause 6.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.4.

6.5.1.4.4 Test Description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.1.4.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [5] ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.Editor note: whether to revise power level to be gradually changed

Table 6.5.1.4.4-1 - SNR variation for in-sync testing



6.5.1.4.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table [5.3.5-1] and Table [5.3.6-1] of 38.521-1 [17].

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

Table 6.5.1.4.4.1-1: Supported test configurations for NR FR1 PCell

Configuration	Description
1	FDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz
2	TDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz
3	TDD, SSB SCS 30 KHz, data SCS 30KHz, BW 40MHz
Note: The UE is only required to pass in one of the supported test configurations in FR1	

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

Table 6.5.1.4.4.1-2: Initial conditions for SA FR1 radio link monitoring in-sync test for NR PCell configured with SSB-based RLM RS in DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.1.4.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

PDCCH transmission parameters are given in Table 4.5.1.4.4.1-3

Table 6.5.1.4.4.1-3: PDCCH transmission parameters for in-sync

Attribute	Value for BLER Configuration #0
DCI payload size	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	4
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	0dB
Bandwidth (MHz)	TBD
Sub-carrier spacing (kHz)	TBD
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

1. Message contents are defined in clause 6.5.1.4.4.3.

2. There is one cell (Cell 1), which is the active NR cell, in the test. The power levels and settings are set according to Annex TBD, Table TBD. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2

3. The general test parameters are given in Table 6.5.1.4.5-4 below.

4. Downlink signals for NR cell are initially set up according to Annex [C.0], [C.1], [C.2], [C.3.1] and uplink signals according to Annex [G.0], [G.1], [G.2], [G.3.1].

Table 6.5.1.4.4.1-4: General test parameters for FR1 in-sync testing in DRX mode

Parameter		Unit	Value Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52
	Config 2		10: $N_{RB,c}$ = 52
	Config 3		40: $N_{RB,c}$ = 106
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
TDD Configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
CORESET Reference Channel	Config 1		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 KHz
	Config 3		30 KHz
PRACH Configuration	Config 1, 2		Table A.3.8.2.4-1
	Config 3		Table A.3.8.2.4-1
SSB index assigned as RLM RS			0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX Configuration			Table A.3.3.3-1
Gap pattern ID			N.A.

Layer 3 filtering			*Enabled*
T310 timer		ms	2000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		[CSI-RS.1.3 FDD]
	Config 2		[CSI-RS.1.3 TDD]
	Config 3		[CSI-RS.2.3 TDD]
T1		s	4
T2		s	1.6
T3		s	1.36
T4		s	0.4
T5		s	1.4
D1		s	1
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.			

6.5.1.4.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.1.4.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states.. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 1] with a reporting periodicity as mentioned in the above table 4.5.1.4.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* according to TS 38.508-1 [6] clause 4.5.

2. Set the parameters according to T1 in Table 4.5.1.4.4-1 for subtest 1 and 2. Propagation conditions are set according to Annex TBD. T1 starts.

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

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

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

6. When T4 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.4.5-1. T5 starts.

7. If the SS detects uplink power equal to or higher than -39 dBm in the On-duration part of every DRX cycle in the subframe according the configured CQI reporting mode (PUCCH 1-0) during the period from time point A to time point F (1120 ms after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

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

6.5.1.4.4.3 Message Contents

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

Table 4.5.1.4.4.3-1: Common Exception messages for SA FR1 Radio Link Monitoring In-Sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode

TBD

6.5.1.4.5 Test Requirement

The requirements in this section apply for each SSB based RLM-RS resource configured for the PCell, provided that the SSB configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in section 6.5.1.4.3.

Table 6.5.1.4.5-1 defines the cell specific primary level settings.

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

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

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

Table A.4.5.1.4.5-1: Cell specific test parameters for FR1 for in-sync radio link monitoring tests in DRX mode

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	4				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0				
EPRE ratio of PBCH DMRS to SSS		dB	0				
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR	Config 1	dB	1	-7	-15	-4.5	1
	Config 2		1	-7	-15	-4.5	1
	Config 3		1	-7	-15	-4.5	1
N_{oc}	Config 1	dBm/15 KHz	-98				
	Config 2		-98				
	Config 3		-98				
Propagation condition			TDL-C 300ns 100Hz				
Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG. Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs. Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.6.5.1.4.1-1. Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in section A.3.6.							

6.5.1.5 NR SA FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- There are brackets in test requirements.

- Some parts of TC are TBDs.

-TT is incomplete.

- Cell mapping is missing.

6.5.1.5.1 Test purpose

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

6.5.1.5.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting CSI-RS based RLM.

6.5.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.5.

6.5.1.5.4 Test description

The test consists of two subtests with one cell configured, the NR PCell; the difference between the two subtests is whether the measurement gap is configured on the PCell or not. Each subtest consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 6.5.1.5.4-1 shows the three different time durations and the corresponding variation of the downlink SNR in the active cell to emulate out-of-sync states.

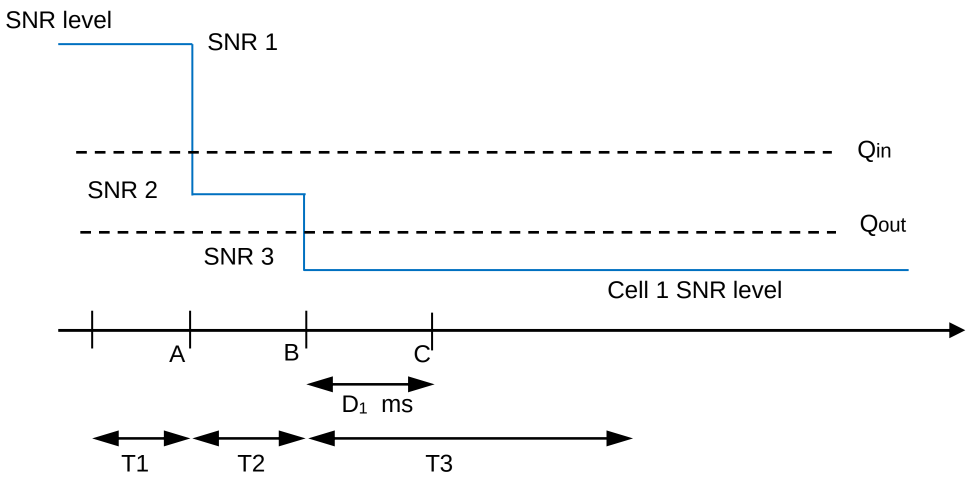


Figure 6.5.1.5.4-1: SNR variation for out-of-sync testing

6.5.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.1.5.4.1-1.

Table 6.5.1.5.4.1-1: Supported test configurations

Configuration	Description
6.5.1.5-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.1.5-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.1.5-3	TDD duplex mode, 30kHz SSB SCS, 40MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equirement and the DUT according to the parameters in Table 6.5.1.5.4.1-2.

Table 6.5.1.5.4.1-2: Initial conditions for NR SA radio link monitoring

<table>
<tr><th>Parameter</th><th colspan="2">Value</th><th>Comment</th></tr>
<tr><td>Test environment</td><td colspan="2">NC</td><td>As specified in TS 38.508-1 [14] clause 4.1.</td></tr>
<tr><td>Test frequencies</td><td colspan="3">As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.</td></tr>
<tr><td>Channel bandwidth</td><td colspan="3">As specified by the test configuration selected from Table 6.5.1.5.4.1-1.</td></tr>
<tr><td>Propagation conditions</td><td colspan="2">AWGN</td><td>As specified in Annex C.2.1</td></tr>
<tr><td rowspan="2">Connection Diagram</td><td>TE Part</td><td>A.3.TBD</td><td rowspan="2">As specified in TS 38.508-1 [14] Annex A.</td></tr>
<tr><td>DUT Part</td><td>A.3.TBD</td></tr>
<tr><td>Exceptions to connection diagram</td><td colspan="2">N/A</td><td></td></tr>
</table>

1. The general test parameter settings are set up according to Table 6.5.1.5.4.1-3. The measurement gap configuration for subtest 2 is according to Table 6.5.1.5.4.1-4. The NZP-CSI-RS configuration for subtest 1 and 2 is according to Table 6.5.1.5.4.1-5.

2. Message contents are defined in clause 6.5.1.5.4.3.

3. There are one cell in the test, where Cell 1 is the NR PCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 6.5.1.5.5-1 for this test. Cell 1 is configured according to Annex C.1.1 and C.1.2.

Table 6.5.1.5.4.1-3: General test parameters for FR1 PCell for CSI-RS out-of-sync testing in non-DRX mode

Parameter		Unit	Value	
			Test 1	Test 2
Active PCell			Cell 1	Cell 1
RF Channel Number			1	1
Duplex mode	Config 1		FDD	FDD
	Config 2, 3		TDD	TDD
TDD Configuration	Config 1		Not Applicable	Not Applicable
	Config 2		[TDDConf.1.1]	[TDDConf.1.1]
	Config 3		[TDDConf.1.2]	[TDDConf.1.2]
CORESET Reference Channel	Config 1		[CR. 1.1 FDD]	[CR. 1.1 FDD]
	Config 2		[CR. 1.1 TDD]	[CR. 1.1 TDD]
	Config 3		[CR. 2.1 TDD]	[CR. 2.1 TDD]
SSB Configuration	Config 1		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
	Config 2		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
	Config 3		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
SMTC Configuration	Config 1, 2		FR1 patterm 1	FR1 patterm 1
	Config 3		FR1 pattern 2	FR1 pattern 2
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 KHz	15 KHz
	Config 3		30 KHz	30 KHz
csi-RS-Index assigned as RLM RS			[0]	[0]
OCNG parameters			TBD	TBD
CP length			Normal	Normal
Correlation Matrix and Antenna Configuration			[2x2 Low]	[2x2 Low]
Out of sync transmission parameters	DCI format		1-0	1-0
	Number of Control OFDM symbols		2	2
	Aggregation level	CCE	8	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4	4
	DMRS precoder granularity		REG bundle size	REG bundle size
	REG bundle size		6	6
DRX			*OFF*	*OFF*
Gap pattern ID			[N.A.]	*[*gp0*]
Layer 3 filtering			*Enabled*	*Enabled*
T310 timer		ms	*0*	*0*
T311 timer		ms	1000	1000
N310			1	1
N311			1	1
NZP CSI-RS configuration			[ResourceId 1]	[ResourceId 0]
ZP CSI-RS configuation			TBD	TBD
CSI-IM configuration			TBD	TBD
Periodic CSI reporting			PUCCH	PUCCH
CSI reporting periodicity	Config 1, 2	slot	[5]	[5]
	Config 3		[10]	[10]
T1		s	1	1
T2		s	0.4	0.4
T3		s	[0.6]	[0.6]
D1		s	[0.24]	[0.44]
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

Table 6.5.1.5.4.1-4: Measurement gap configuration for FR1 CSI-RS out-of-sync radio link monitoring in non-DRX mode

Field	Test 2
	Value
gapOffset	[0]

Table 6.5.1.5.4.1-5: NZP-CSI-RS resource configuration for FR1 CSI-RS out-of-sync radio link monitoring in non-DRX mode

Field	ResourceId 0	ResourceId 1
	Value	Value
frequencyDomainAllocation Note 1	row1	row2
startingRB	0	0
nrofRBs	Note 2	Note 2
Note 1: TS 38.211 [6] table 7.4.1.5.3-1 Note 2: nrofRBs is derived based on the Configuration in Table A.6.5.1.5.1-1		

6.5.1.5.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [5] or [10] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in subtest 2.

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

2. Set the parameters of Cell 1 according to T1 in Table 6.5.1.5.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.5.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.5.5-1. T3 starts.

5. If the SS:

   a) detects uplink power equal to or higher than [-39] dBm in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect any uplink power higher than [-48.5] dBm from time point C (D1 after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 6.5.1.5.5-1.

7. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in RRC_CONNECTED according to TS 38.508-1 [14] clause FFS.

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

6.5.1.5.4.3 Message contents

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

Table 6.5.1.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

6.5.1.5.5 Test requirement

Tables 6.5.1.5.4.1-3 and 6.5.1.5.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode.

Table 6.5.1.5.5-1: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in non-DRX mode

Parameter		Unit	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
PDCCH_beta		dB	4			4		
PDCCH_DMRS_beta		dB	4			4		
PBCH_beta		dB	0			0		
PSS_beta		dB						
SSS_beta		dB						
PDSCH_beta		dB						
OCNG_beta		dB						
SNR	Config 1	dB	TBD	TBD	TBD	TBD	TBD	TBD
	Config 2		TBD	TBD	TBD	TBD	TBD	TBD
	Config 3		TBD	TBD	TBD	TBD	TBD	TBD
N_{oc}	Config 1	dBm/15KHz	[-98] + TT			[-98] + TT		
	Config 2		[-98] + TT			[-98] + TT		
	Config 3		[-98] + TT			[-98] + TT		
Propagation condition			[TDL-C 300ns 100Hz]			[TDL-C 300ns 100Hz]		
Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1. Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1. Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG. Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs. Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.6.5.1.5.1-1. Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].								

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

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 no later than time point C (D_1 = [TBD] ms after the start of the time duration T3) on the PCell.

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

6.5.1.6 NR SA FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- There are brackets in test requirements.

- Some parts of TC are TBDs.

-TT is incomplete.

- Cell mapping is missing.

6.5.1.6.1 Test purpose

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

6.5.1.6.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting CSI-RS based RLM.

6.5.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.6.

6.5.1.6.4 Test description

The test consists of two subtests with one cell configured, the NR PCell; the difference between the two subtests is whether the measurement gap is configured on the PCell or not. Each subtest consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.6.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate in-sync states.

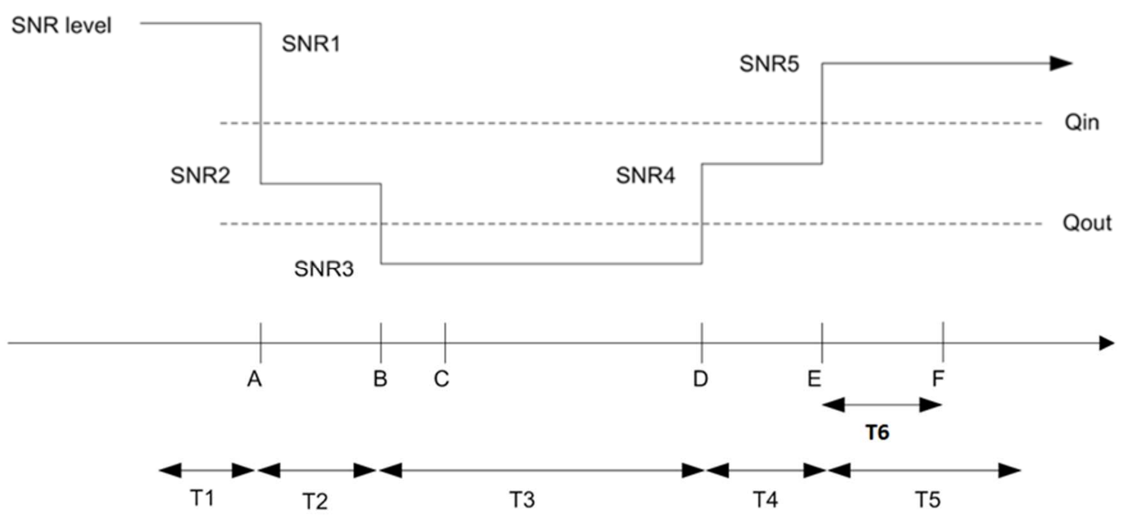


Figure 6.5.1.6.4-1: SNR variation for In-sync testing

6.5.1.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.1.6.4.1-1.

Table 6.5.1.6.4.1-1: Supported test configurations

Configuration	Description
6.5.1.6-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.1.6-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.1.6-3	TDD duplex mode, 30kHz SSB SCS, 40MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equirement and the DUT according to the parameters in Table 6.5.1.6.4.1-2.

Table 6.5.1.6.4.1-2: Initial conditions for NR SA radio link monitoring

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.1.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.5.1.6.4.1-3. The measurement gap configuration for subtest 2 is according to Table 6.5.1.6.4.1-4. The NZP-CSI-RS configuration for subtest 1 and 2 is according to Table 6.5.1.6.4.1-5.

2. Message contents are defined in clause 6.5.1.6.4.3.

3. There are one cell in the test, where Cell 1 is the NR PCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 6.5.1.6.5-1 for this test. Cell 1 is configured according to Annex C.1.1 and C.1.2.

Table 6.5.1.6.4.1-3: General test parameters for FR1 PCell for CSI-RS In-sync testing in non-DRX mode

Parameter		Unit	Value	
			Test 1	Test 2
Active PCell			Cell 1	Cell 1
RF Channel Number			1	1
Duplex mode	Config 1		FDD	FDD
	Config 2, 3		TDD	TDD
TDD Configuration	Config 1		Not Applicable	Not Applicable
	Config 2		[TDDConf.1.1]	[TDDConf.1.1]
	Config 3		[TDDConf.1.2]	[TDDConf.1.2]
CORESET Reference Channel	Config 1		[CR. 1.1 FDD]	[CR. 1.1 FDD]
	Config 2		[CR. 1.1 TDD]	[CR. 1.1 TDD]
	Config 3		[CR. 2.1 TDD]	[CR. 2.1 TDD]
SSB Configuration	Config 1		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
	Config 2		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
	Config 3		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
SMTC Configuration	Config 1, 2		FR1 patterm 1	FR1 patterm 1
	Config 3		FR1 pattern 2	FR1 pattern 2
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 KHz	15 KHz
	Config 3		30 KHz	30 KHz
csi-RS-Index assigned as RLM RS			[0]	[0]
OCNG parameters			TBD	TBD
CP length			Normal	Normal
Correlation Matrix and Antenna Configuration			[2x2 Low]	[2x2 Low]
Out of sync transmission parameters	DCI format		1-0	1-0
	Number of Control OFDM symbols		2	2
	Aggregation level	CCE	8	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4	4
	DMRS precoder granularity		REG bundle size	REG bundle size
	REG bundle size		6	6
In sync transmission parameters	DCI format		1-0	1-0
	Number of Control OFDM symbols		2	2
	Aggregation level	CCE	4	4
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	0
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	0
	DMRS precoder granularity		REG bundle size	REG bundle size
	REG bundle size		6	6
DRX			*OFF*	*OFF*
Gap pattern ID			[N.A.]	*[*gp0*]*
Layer 3 filtering			*Enabled*	*Enabled*

T310 timer		ms	*0*	*0*
T311 timer		ms	1000	1000
N310			1	1
N311			1	1
NZP CSI-RS configuration			[ResourceId 1]	[ResourceId 0]
ZP CSI-RS configuation			TBD	TBD
CSI-IM configuration			TBD	TBD
Periodic CSI reporting			PUCCH	PUCCH
CSI reporting periodicity	Config 1, 2	slot	[5]	[5]
	Config 3		[10]	[10]
T1		s	1	1
T2		s	0.4	0.4
T3		s	[0.6]	[0.6]
D1		s	[0.24]	[0.44]
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

Table 6.5.1.6.4.1-4: Measurement gap configuration for FR1 CSI-RS In-sync radio link monitoring in non-DRX mode

Field	Test 2
	Value
gapOffset	[0]
Note 1: RLM RS is partially overlapped with measurement gap	

Table 6.5.1.6.4.1-5: NZP-CSI-RS resource configuration for FR1 CSI-RS In-sync radio link monitoring in non-DRX mode

Field	ResourceId 0	ResourceId 1
	Value	Value
frequencyDomainAllocation[Note 1]	row1	row2
startingRB	0	0
nrofRBs	Note 2	Note 2
Note 1: TS 38.211 [6] table 7.4.1.5.3-1 Note 2: nrofRBs is derived based on the Configuration in TS 38.133 [6] Table A.4.5.1.6.1-1		

6.5.1.6.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [5] or [10] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in subtest 2.

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

2. Set the parameters of Cell 1 according to T1 in Table 6.5.1.6.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.6.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.6.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.1.6.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.1.6.5-1. T5 starts.

7. If the SS detects uplink power equal to or higher than [-39] dBm in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point F (T6 after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. After T5 expires, repeat steps 2-7 for both subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.5.1.6.4.3 Message contents

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

Table 6.5.1.6.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

6.5.1.6.5 Test requirement

Tables 6.5.1.6.4.1-3 and 6.5.1.6.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode.

Table 6.5.1.6.5-1: Cell specific test parameters for FR1 for CSI-RS In-sync radio link monitoring in non-DRX mode

Parameter		Unit	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
PDCCH_beta		dB	4			4		
PDCCH_DMRS_beta		dB	4			4		
PBCH_beta		dB	0			0		
PSS_beta		dB						
SSS_beta		dB						
PDSCH_beta		dB						
OCNG_beta		dB						
SNR	Config 1	dB	TBD	TBD	TBD	TBD	TBD	TBD
	Config 2		TBD	TBD	TBD	TBD	TBD	TBD
	Config 3		TBD	TBD	TBD	TBD	TBD	TBD
N_{oc}	Config 1	dBm/15KHz	[-98] + TT			[-98] + TT		
	Config 2		[-98] + TT			[-98] + TT		
	Config 3		[-98] + TT			[-98] + TT		
Propagation condition			[TDL-C 300ns 100Hz]			[TDL-C 300ns 100Hz]		
Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1. Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1. Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG. Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs. Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.6.5.1.6.1-1. Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].								

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

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PCell.

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

6.5.1.7 NR SA FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- There are brackets in test requirements.

- Some parts of TC are TBDs.

-TT is incomplete.

- Cell mapping is missing.

6.5.1.7.1 Test purpose

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

6.5.1.7.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting CSI-RS based RLM and long DRX cycle.

6.5.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.7.

6.5.1.7.4 Test description

The test consists of two subtests with one cell configured, the NR PCell; the difference between the two subtests is whether the measurement gap is configured on the PCell or not. Each subtest consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 6.5.1.7.4-1 shows the three different time durations and the corresponding variation of the downlink SNR in the active cell to emulate out-of-sync states.

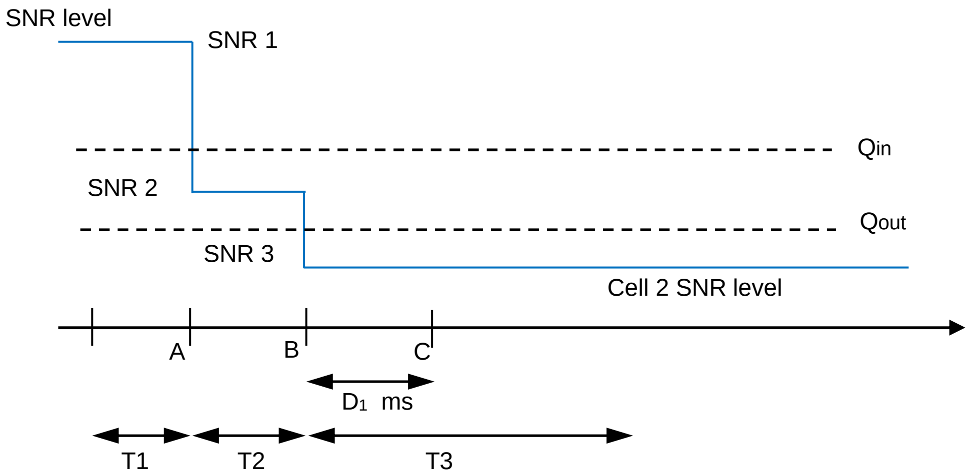


Figure 6.5.1.7.4-1: SNR variation for out-of-sync testing

6.5.1.7.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.5.1.7.4.1-1.

Table 6.5.1.7.4.1-1: Supported test configurations

Configuration	Description
6.5.1.7-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.1.7-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.1.7-3	TDD duplex mode, 30kHz SSB SCS, 40MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equirement and the DUT according to the parameters in Table 6.5.1.7.4.1-2.

Table 6.5.1.7.4.1-2: Initial conditions for NR SA radio link monitoring

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.1.7.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.5.1.7.4.1-3. The measurement gap configuration for subtest 2 is according to Table 6.5.1.7.4.1-4. The NZP-CSI-RS configuration for subtest 1 and 2 is according to Table 6.5.1.7.4.1-5. The DRX configuration for subtest 1 and 2 is according to Table 6.5.1.7.4.1-6. The time alignment timer configuration for subtest 1 and 2 is according to Table 6.5.1.7.4.1-7.

2. Message contents are defined in clause 6.5.1.7.4.3.

3. There are one cell in the test, where Cell 1 is the NR PCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 6.5.1.7.5-1 for this test. Cell 1 is configured according to Annex C.1.1 and C.1.2.

Table 6.5.1.7.4.1-3: General test parameters for FR1 PCell for CSI-RS out-of-sync testing in DRX mode

Parameter		Unit	Value	
			Test 1	Test 2
Active PCell			Cell 1	Cell 1
RF Channel Number			1	1
Duplex mode	Config 1		FDD	FDD
	Config 2, 3		TDD	TDD
TDD Configuration	Config 1		Not Applicable	Not Applicable
	Config 2		[TDDConf.1.1]	[TDDConf.1.1]
	Config 3		[TDDConf.1.2]	[TDDConf.1.2]
CORESET Reference Channel	Config 1		[CR. 1.1 FDD]	[CR. 1.1 FDD]
	Config 2		[CR. 1.1 TDD]	[CR. 1.1 TDD]
	Config 3		[CR. 2.1 TDD]	[CR. 2.1 TDD]
SSB Configuration	Config 1		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
	Config 2		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
	Config 3		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
SMTC Configuration	Config 1, 2		FR1 patterm 1	FR1 patterm 1
	Config 3		FR1 patterm 2	FR1 patterm 2
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 KHz	15 KHz
	Config 3		30 KHz	30 KHz
csi-RS-Index assigned as RLM RS			[0]	[0]
OCNG parameters			TBD	TBD
CP length			Normal	Normal
Correlation Matrix and Antenna Configuration			[2x2 Low]	[2x2 Low]
Out of sync transmission parameters	DCI format		1-0	1-0
	Number of Control OFDM symbols		2	2
	Aggregation level	CCE	8	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4	4
	DMRS precoder granularity		REG bundle size	REG bundle size
	REG bundle size		6	6
DRX			*640*	*640*
Gap pattern ID			[N.A.]	*[*gp0*]*
Layer 3 filtering			*Enabled*	*Enabled*
T310 timer		ms	*0*	*0*
T311 timer		ms	1000	1000
N310			1	1
N311			1	1
NZP CSI-RS configuration			[ResourceId 1]	[ResourceId 0]
ZP CSI-RS configuation			TBD	TBD
CSI-IM configuration			TBD	TBD
Periodic CSI reporting			PUCCH	PUCCH
CSI reporting periodicity	Config 1, 2	slot	[5]	[5]
	Config 3		[10]	[10]
T1		s	1	1
T2		s	0.4	0.4
T3		s	[0.6]	[0.6]
D1		s	[0.24]	[0.44]
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

Table 6.5.1.7.4.1-4: Measurement gap configuration for FR1 CSI-RS out-of-sync radio link monitoring in DRX mode

Field	Test 2
	Value
gapOffset	[0]
Note 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM RS is partially overlapped with measurement gap)	

Table 6.5.1.7.4.1-5: NZP-CSI-RS resource configuration for FR1 CSI-RS out-of-sync radio link monitoring in DRX mode

Field	ResourceId 0	ResourceId 1
	Value	Value
frequencyDomainAllocation Note 1	row1	row2
startingRB	0	0
nrofRBs	Note 2	Note 2
Note 1: TS 38.211 [6] table 7.4.1.5.3-1 Note 2: nrofRBs is derived based on the Configuration in TS 38.133 [6] Table A.4.5.1.7.1-1		

Table 6.5.1.7.4.1-6: DRX Configuration for FR1 CSI-RS out-of-sync radio link monitoring in DRX mode.

Field	Test 1	Test 2
	Value	Value
drx-onDurationTimer	[ms6]	[ms6]
drx-InactivityTimer	[ms1]	[ms1]
drx-RetransmissionTimerDL	[sl1]	[sl1]
drx-RetransmissionTimerUL	[sl1]	[sl1]
longDRX-CycleStartOffset	[ms640]	[ms40]
shortDRX	disable	disable

Table 6.5.1.7.4.1-7: TimeAlignmentTimer Configuration for FR1 CSI-RS out-of-sync radio link monitoring in DRX mode.

Field		Test 1	Test 2
		Value	Value
TimeAlignmentTimer		infinity	infinity
periodicityAndOffset in SchedulingRequestResourceConfig	Config 1, 2	[sl5]	[sl5]
	Config 3	[sl10]	[sl10]

6.5.1.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [5] or [10] ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in subtest 2.

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

2. Set the parameters of Cell 1 according to T1 in Table 6.5.1.7.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.7.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.7.5-1. T3 starts.

5. If the SS:

   a) detects uplink power equal to or higher than [-39] dBm in the On-duration part of every DRX cycle in the slots configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect any uplink power higher than [-48.5] dBm from time point C (D1 after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 6.5.1.7.5-1.

7. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in RRC_CONNECTED according to TS 38.508-1 [14] clause FFS.

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

6.5.1.7.4.3 Message contents

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

Table 6.5.1.7.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

6.5.1.7.5 Test requirement

Tables 6.5.1.7.4.1-3 and 6.5.1.7.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode.

Table 6.5.1.7.5-1: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in DRX mode

Parameter		Unit	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
PDCCH_beta		dB	4			4		
PDCCH_DMRS_beta		dB	4			4		
PBCH_beta		dB	0			0		
PSS_beta		dB						
SSS_beta		dB						
PDSCH_beta		dB						
OCNG_beta		dB						
SNR	Config 1	dB	TBD	TBD	TBD	TBD	TBD	TBD
	Config 2		TBD	TBD	TBD	TBD	TBD	TBD
	Config 3		TBD	TBD	TBD	TBD	TBD	TBD
N_{oc}	Config 1	dBm/15KHz	[-98] + TT			[-98] + TT		
	Config 2		[-98] + TT			[-98] + TT		
	Config 3		[-98] + TT			[-98] + TT		
Propagation condition			[TDL-C 300ns 100Hz]			[TDL-C 300ns 100Hz]		

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.6.5.1.7.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

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

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on PCell.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 (PCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 (PCell) no later than time point C (D_1 = [TBD] ms after the start of the time duration T3) on the PCell.

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

6.5.1.8 NR SA FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode

Editor's note:

- Message contents are not complete.
- Connection diagram is TBD.
- There are brackets in test requirements.
- Some parts of TC are TBDs.
- TT is incomplete.
- Cell mapping is missing.

6.5.1.8.1 Test purpose

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

6.5.1.8.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting CSI-RS based RLM and long DRX cycle.

6.5.1.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.8.

6.5.1.8.4 Test description

The test consists of two subtests with one cell configured, the NR PCell; the difference between the two subtests is whether the measurement gap is configured on the PCell or not. Each subtest consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.8.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate in-sync states.

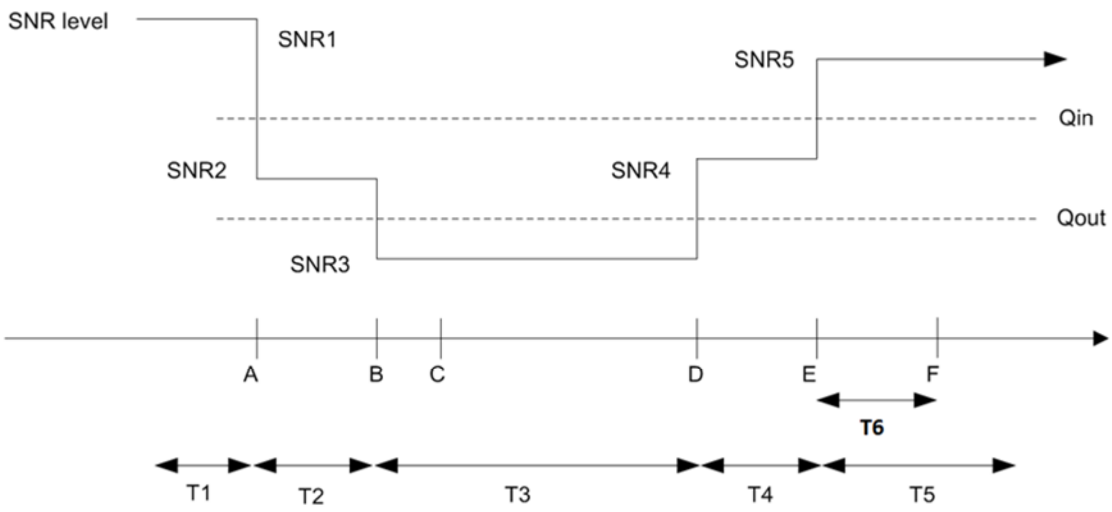


Figure 6.5.1.8.4-1: SNR variation for In-sync testing

6.5.1.8.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.5.1.8.4.1-1.

Table 6.5.1.8.4.1-1: Supported test configurations

Configuration	Description
6.5.1.8-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.1.8-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.1.8-3	TDD duplex mode, 30kHz SSB SCS, 40MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equirement and the DUT according to the parameters in Table 6.5.1.8.4.1-2.

Table 6.5.1.8.4.1-2: Initial conditions for NR SA radio link monitoring

<table>
<tr><th>Parameter</th><th colspan="2">Value</th><th>Comment</th></tr>
<tr><td>Test environment</td><td colspan="2">NC</td><td>As specified in TS 38.508-1 [14] clause 4.1.</td></tr>
<tr><td>Test frequencies</td><td colspan="3">As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.</td></tr>
<tr><td>Channel bandwidth</td><td colspan="3">As specified by the test configuration selected from Table 6.5.1.8.4.1-1.</td></tr>
<tr><td>Propagation conditions</td><td colspan="2">AWGN</td><td>As specified in Annex C.2.1</td></tr>
<tr><td rowspan="2">Connection Diagram</td><td>TE Part</td><td>A.3.TBD</td><td rowspan="2">As specified in TS 38.508-1 [14] Annex A.</td></tr>
<tr><td>DUT Part</td><td>A.3.TBD</td></tr>
<tr><td>Exceptions to connection diagram</td><td colspan="2">N/A</td><td></td></tr>
</table>

1. The general test parameter settings are set up according to Table 6.5.1.8.4.1-3. The measurement gap configuration for subtest 2 is according to Table 6.5.1.8.4.1-4. The NZP-CSI-RS configuration for subtest 1 and 2 is according to Table 6.5.1.8.4.1-5. The DRX configuration for subtest 1 and 2 is according to Table 6.5.1.8.4.1-6. The time alignment timer configuration for subtest 1 and 2 is according to Table 6.5.1.8.4.1-7.

2. Message contents are defined in clause 6.5.1.8.4.3.

3. There are one cell in the test, where Cell 1 is the NR PCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 1 is configured according to Annex C.1.1 and C.1.2.

Table 6.5.1.8.4.1-3: General test parameters for FR1 PCell for CSI-RS In-sync testing in DRX mode

Parameter		Unit	Value	
			Test 1	Test 2
Active PCell			Cell 1	Cell 1
RF Channel Number			1	1
Duplex mode	Config 1		FDD	FDD
	Config 2, 3		TDD	TDD
TDD Configuration	Config 1		Not Applicable	Not Applicable
	Config 2		[TDDConf.1.1]	[TDDConf.1.1]
	Config 3		[TDDConf.1.2]	[TDDConf.1.2]
CORESET Reference Channel	Config 1		[CR. 1.1 FDD]	[CR. 1.1 FDD]
	Config 2		[CR. 1.1 TDD]	[CR. 1.1 TDD]
	Config 3		[CR. 2.1 TDD]	[CR. 2.1 TDD]
SSB Configuration	Config 1		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
	Config 2		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
	Config 3		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)
SMTC Configuration	Config 1, 2		FR1 patterm 1	FR1 patterm 1
	Config 3		FR1 patterm 2	FR1 patterm 2
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 KHz	15 KHz
	Config 3		30 KHz	30 KHz
csi-RS-Index assigned as RLM RS			[0]	[0]
OCNG parameters			TBD	TBD
CP length			Normal	Normal
Correlation Matrix and Antenna Configuration			[2x2 Low]	[2x2 Low]
Out of sync transmission parameters	DCI format		1-0	1-0
	Number of Control OFDM symbols		2	2
	Aggregation level	CCE	8	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4	4
	DMRS precoder granularity		REG bundle size	REG bundle size
	REG bundle size		6	6
In sync transmission parameters	DCI format		1-0	1-0
	Number of Control OFDM symbols		2	2
	Aggregation level	CCE	4	4
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	0
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	0
	DMRS precoder granularity		REG bundle size	REG bundle size
	REG bundle size		6	6
DRX			640	640
Gap pattern ID			[N.A.]	*[*gp0*]
Layer 3 filtering			*Enabled*	*Enabled*
T310 timer		ms	*0*	*0*

T311 timer		ms	1000	1000
N310			1	1
N311			1	1
NZP CSI-RS configuration			[ResourceId 1]	[ResourceId 0]
ZP CSI-RS configuation			TBD	TBD
CSI-IM configuration			TBD	TBD
Periodic CSI reporting			PUCCH	PUCCH
CSI reporting periodicity	Config 1, 2, 4, 5	slot	[5]	[5]
	Config 3, 6		[10]	[10]
T1		s	1	1
T2		s	0.4	0.4
T3		s	[0.6]	[0.6]
D1		s	[0.24]	[0.44]
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

Table 6.5.1.8.4.1-4: Measurement gap configuration for FR1 CSI-RS In-sync radio link monitoring in DRX mode

Field	Test 2
	Value
gapOffset	[0]
Note 1: RLM RS is partially overlapped with measurement gap	

Table 6.5.1.8.4.1-5: NZP-CSI-RS resource configuration for FR1 CSI-RS In-sync radio link monitoring in DRX mode

Field	ResourceId 0	ResourceId 1
	Value	Value
frequencyDomainAllocation[Note 1]	row1	row2
startingRB	0	0
nrofRBs	Note 2	Note 2
Note 1: TS 38.211 [6] table 7.4.1.5.3-1 Note 2: nrofRBs is derived based on the Configuration in TS 38.133 [6] Table A.4.5.1.8.1-1		

Table 6.5.1.8.4.1-6: DRX Configuration for FR1 CSI-RS in-sync radio link monitoring in DRX mode.

Field	Test 1	Test 2
	Value	Value
drx-onDurationTimer	[ms6]	[ms6]
drx-InactivityTimer	[ms1]	[ms1]
drx-RetransmissionTimerDL	[sl1]	[sl1]
drx-RetransmissionTimerUL	[sl1]	[sl1]
longDRX-CycleStartOffset	[ms640]	[ms40]
shortDRX	disable	disable

Table 6.5.1.8.4.1-7: TimeAlignmentTimer Configuration for FR1 CSI-RS in-sync radio link monitoring in DRX mode.

Field		Test 1	Test 2
		Value	Value
TimeAlignmentTimer		infinity	infinity
periodicityAndOffset in SchedulingRequestResourceConfig	Config 1, 2	[sl5]	[sl5]
	Config 3	[sl10]	[sl10]

6.5.1.8.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [5] or [10] ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in subtest 2.

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

2. Set the parameters of Cell 1 according to T1 in Table 6.5.1.8.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.8.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.8.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.1.8.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.1.8.5-1. T5 starts.

7. If the SS detects uplink power equal to or higher than [-39] dBm in the On-duration part of every DRX cycle in the configured slots for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point F (T6 after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. After T5 expires, repeat steps 2-7 for both subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.5.1.8.4.3 Message contents

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

Table 6.5.1.8.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

6.5.1.8.5 Test requirement

Tables 6.5.1.8.4.1-3 and 6.5.1.8.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode.

Table 6.5.1.8.5-1: Cell specific test parameters for FR1 for CSI-RS In-sync radio link monitoring in DRX mode

Parameter		Unit	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
PDCCH_beta		dB	4			4		
PDCCH_DMRS_beta		dB	4			4		
PBCH_beta		dB	0			0		
PSS_beta		dB						
SSS_beta		dB						
PDSCH_beta		dB						
OCNG_beta		dB						
SNR	Config 1	dB	TBD	TBD	TBD	TBD	TBD	TBD
	Config 2		TBD	TBD	TBD	TBD	TBD	TBD
	Config 3		TBD	TBD	TBD	TBD	TBD	TBD
N_{oc}	Config 1	dBm/15K Hz	[-98] + TT			[-98] + TT		
	Config 2		[-98] + TT			[-98] + TT		
	Config 3		[-98] + TT			[-98] + TT		
Propagation condition			[TDL-C 300ns 100Hz]			[TDL-C 300ns 100Hz]		

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.6.5.1.8.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

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

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PCell.

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

6.5.2 Interruption

6.5.3 SCell activation and deactivation delay

6.5.4 UE UL carrier RRC reconfiguration delay

6.5.4.0 Minimum conformance requirements

6.5.4.0.1 Minimum conformance requirements for UL carrier RRC reconfiguration delay

[TS 38.133, clause 8.4.2]

When the UE receives a RRC message implying NR UL or Supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within $T_{UL\_carrier\_config}$ from the end of the last slot containing the RRC command.

$T_{UL\_carrier\_config}$ equals the maximum RRC procedure delay defined in clause x.y in TS 38.331 [2] plus the interruption time specified in TS 38.133 [6] section 8.2.1.2.6.

[TS 38.133, clause 8.4.3]

When the UE receives a RRC message implying NR UL or Supplementary UL carrier deconfiguration RRC signalling, the UE shall stop UL signalling on the deconfigured UL carrier within $T_{UL\_carrier\_deconfig}$ from the end of the last slot containing the RRC command.

$T_{UL\_carrier\_deconfig}$ equals the maximum RRC procedure delay defined in clause x.y in TS 38.331 [2].

The normative reference for this requirement is TS 38.133 [6] clause 8.4.

6.5.4.1 NR SA FR1 UE UL carrier RRC reconfiguration delay

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- There are brackets in test requirements.

- Some parts of TC are TBDs.

-TT is incomplete.

- Cell mapping is missing.

6.5.4.1.1 Test purpose

To verify that when the UE receives a RRC message implying NR UL or Supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within the time limits specified in TS 38.133 [6] section 8.4.2 and 8.4.3 for configuring and deconfiguring, respectively.

6.5.4.1.2 Test applicability

This test applies to UE release 15 supporting NR standalone.

6.5.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.4.1.

6.5.4.1.4 Test description

6.5.4.1.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.5.4.1.4.1-1.

Table 6.5.4.1.4.1-1: Supported test configurations

Configuration	PSCell (Cell 1)	SCell (Cell 2)
6.5.4.1-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	DL and UL: 15kHz SSB SCS, 10MHz bandwidth, FDD duplex mode; SUL: 15kHz SCS, 10MHz bandwidth, SUL duplex mode
6.5.4.1-2	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	DL and UL: 15kHz SSB SCS, 10MHz bandwidth, TDD duplex mode; SUL: 15kHz SCS, 10MHz bandwidth, SUL duplex mode
6.5.4.1-3	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	DL and UL: 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, 40MHz bandwidth, SUL duplex mode
6.5.4.1-4	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, 10MHz bandwidth, FDD duplex mode; SUL: 15kHz SCS, 10MHz bandwidth, SUL duplex mode
6.5.4.1-5	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, 10MHz bandwidth, TDD duplex mode; SUL: 15kHz SCS, 10MHz bandwidth, SUL duplex mode
6.5.4.1-6	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	DL and UL: 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, 40MHz bandwidth, SUL duplex mode
6.5.4.1-7	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, 10MHz bandwidth, FDD duplex mode; SUL: 15kHz SCS, 10MHz bandwidth, SUL duplex mode
6.5.4.1-8	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, 10MHz bandwidth, TDD duplex mode; SUL: 15kHz SCS, 10MHz bandwidth, SUL duplex mode
6.5.4.1-9	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	DL and UL: 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, 40MHz bandwidth, SUL duplex mode
Note: The UE is only required to be tested in one of the supported test configurations		

Configure the test equirement and the DUT according to the parameters in Table 6.5.4.1.4.1-2.

Table 6.3.4.1.4.1-2: Initial conditions for NR SA FR1 UE UL carrier RRC reconfiguration delay

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.4.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.5.4.1.4.1-3.
2. Message contents are defined in clause 6.5.4.1.4.3.
3. There are two NR FR1 carriers and two cells in the test. Cell 1 is PCell on the primary component carrier, Cell 2 is SCell on the secondary component carrier. Cell 1 is the cell used for connection setup with the power levels set according to Table A. 6.5.4.1.5-1 for this test. Cell 2 is configured according to Annex C.1.1 and C.1.2.

Table 6.5.4.1.4.1-3: General test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on Pcell

Parameter	Unit	Test configuration	Value	Comment
RF Channel Number		Config 1,2,3, 4, 5, 6, 7, 8, 9	1, 2	Three radio channels are used for these two tests.
Active cell		Config 1,2,3, 4, 5, 6, 7, 8, 9	Cell 1: FR1 PCell Cell 2: FR1 SCell	E-UTRAN PCell on RF channel number 1 FR1 SCell on RF channel number 2
CP length		Config 1,2,3, 4, 5, 6, 7, 8, 9	Normal	
DRX		Config 1,2,3, 4, 5, 6, 7, 8, 9	OFF	
Measurement gap pattern Id		Config 1,2,3, 4, 5, 6, 7, 8, 9	OFF	
Filter coefficient		Config 1,2,3, 4, 5, 6, 7, 8, 9	0	L3 filtering is not used
T1	s	Config 1,2,3, 4, 5, 6, 7, 8, 9	5	
T2	s	Config 1,2,3, 4, 5, 6, 7, 8, 9	5	
T3	s	Config 1,2,3, 4, 5, 6, 7, 8, 9	5	

6.5.4.1.4.2 Test procedure

There are two cells: FR1 PCell (cell 1) and FR1 SCell (cell 2). Both NR uplink and supplementary uplink are broadcast by *ServingCellConfigCommonSIB.* In test 1, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, NR uplink of cell 2 is configured to UE. At the start of T2, a supplementary uplink of cell 2 is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the supplementary uplink is released through *RRCReconfiguration*.

In test 2, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, supplementray uplink on cell 2 is configured to UE. At the start of T2, a NR uplink is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the NR uplink is released through *RRCReconfiguration*.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters according to TS 38.508-1 [14] FFS.

2. Both NR uplink and supplementary uplink are broadcast by *ServingCellConfigCommonSIB.* The test parameters for PCell and SCell are given in Table 6.5.4.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. The SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause FFS with the message content exceptions defined in clause 6.5.4.1.4.3.

4. In test 1 NR uplink of cell 2 is configured to UE then UE shall transmit data on NR UL carrier only. If UE transmits data on NR UL carrier on SCell within [20] ms from the start of T1, then count a success for the event “reconfiguration” otherwise count a failure for event “reconfiguration”.

   In test 2 supplementray uplink on cell 2 is configured to UE, then UE shall transmit data on SUL carrier only. If UE transmits data on SUL carrier on SCell within [20] ms from the start of T1, then count a success for the event “reconfiguration” otherwise count a failure for event “reconfiguration”.

5. In test 1, at the start of T2, a supplementary uplink of cell 2 is configured to UE through RRCReconfiguration, then UE shall start transmission both on the NR uplink and supplementary uplink. If UE transmits data on both on the NR uplink and supplementary uplink from the start of T2, then count a success for the event “reconfiguration” otherwise count a failure for event “reconfiguration”.

   In test 2, at the start of T2, a NR uplink is configured to UE through RRCReconfiguration, then UE shall start transmission both on the NR uplink and supplementary uplink. If UE transmits data on both on the NR uplink and supplementary uplink from the start of T2, then count a success for the event “reconfiguration” otherwise count a failure for event “reconfiguration”.

6. In test 1, at the start of T3, the supplementary uplink is released through RRCReconfiguration then UE shall transmit data on SUL carrier only. If UE transmits data on SUL carrier on SCell within [20]ms from the start of T3, then count a success for the event "deconfiguration" otherwise count a failure for event "deconfiguration".

   In test 2, at the start of T3, the NR uplink is released through RRCReconfiguration, then UE shall transmit data on NR UL carrier only. If UE transmits data on NR UL carrier on SCell within [20]ms from the start of T3, then count a success for the event "deconfiguration" otherwise count a failure for event "deconfiguration".

7. Repeat steps 3-6 until a test verdict has been achieved.

Each of the events "reconfiguration" and "deconfiguration" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to FFS in Annex FFS is achieved. Different events may require different times for a verdict.
If all events pass, the test passes. If one event fails, the test fails.

6.5.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 4.6.1.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

6.5.4.1.5 Test requirement

Table 6.5.4.1.5.1-1 and 6.5.4.1.5-2 define the primary level settings including test tolerances for UE UL carrier RRC reconfiguration delay test.

Table 6.5.4.1.5-1: NR Cell specific test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on PCell (Cell 1)

Parameter	Unit	Test Configuration	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3

Channel number		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	2			2		
TDD configuration		Conf 1, 2, 3	N/A			N/A		
		Conf 4, 5, 6	TDD Conf.1.1			TDD Conf.1.1		
		Conf 7, 8, 9	TDD Conf.2.1			TDD Conf.2.1		
$BW_{channel}$	MHz	Conf 1, 2, 3	10: $N_{RB,c}$ = 52			10: $N_{RB,c}$ = 52		
		Conf 4, 5, 6	10: $N_{RB,c}$ = 52			10: $N_{RB,c}$ = 52		
		Conf 7, 8, 9	40: $N_{RB,c}$ = 106			40: $N_{RB,c}$ = 106		
PDSCH reference measurement channel as defined in A.3.1.1		Conf 1, 2, 3	SR.1.1 FDD			SR.1.1 FDD		
		Conf 4, 5, 6	SR.1.1 TDD			SR.1.1 TDD		
		Conf 7, 8, 9	SR 2.1 TDD			SR 2.1 TDD		
RMSI CORESET reference measurement channel as defined in A.3.1.2		Conf 1, 2, 3	CR.1.1 FDD			CR.1.1 FDD		
		Conf 4, 5, 6	CR.1.1 TDD			CR.1.1 TDD		
		Conf 7, 8, 9	CR.2.1 TDD			CR.2.1 TDD		
RMC CORESET reference measurement channel as defined in A.3.1.3		Conf 1, 2, 3	CCR.1.1 FDD			CCR.1.1 FDD		
		Conf 4, 5, 6	CCR.1.1 TDD			CCR.1.1 TDD		
		Conf 7, 8, 9	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern [Note 1]		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	OP.1			OP.1		
SSB configuration		Conf 1, 2, 3, 4, 5, 6	SSB.1 FR1			SSB.1 FR1		
		Conf 7, 8, 9	SSB.2 FR1			SSB.2 FR1		
SMTC configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	SMTC.1			SMTC.1		
DL initial BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	DLBWP.0.1			DLBWP.0.1		
DL dedicated BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	DLBWP.1.1			DLBWP.1.1		
UL dedicated BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	ULBWP.1.1			ULBWP.1.1		
EPRE ratio of PSS to SSS	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	0			0		
EPRE ratio of PBCH_DMRS to SSS								
EPRE ratio of PBCH to PBCH_DMRS								
EPRE ratio of PDCCH_DMRS to SSS								
EPRE ratio of PDCCH to PDCCH_DMRS								
EPRE ratio of PDSCH_DMRS to SSS								
EPRE ratio of PDSCH to PDSCH_DMRS								
EPRE ratio of OCNG DMRS to SSS								
EPRE ratio of OCNG to OCNG DMRS								
N_{oc} Note 2	dBm / 15kHz	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	-102+TT			-102+TT		
	dBm/ SCS	Conf 1,2,3,4,5,6	-102+TT			-102+TT		
		Conf 7,8,9	-99+TT			-99+TT		
$\hat{E}_s/N_{oc}$	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16+TT	16+TT	16+TT	16+TT	16+TT	16+TT

$\hat{E}_s/I_{ot}$ Note 3	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16+TT	16+TT	16+TT	16+TT	16+TT	16+TT
SS-RSRP Note 3	dBm/SCS	Conf 1,2,3,4,5,6	-86+TT	-86+TT	-86+TT	-86+TT	-86+TT	-86+TT
		Conf 7,8,9	-83+TT	-83+TT	-83+TT	-83+TT	-83+TT	-83+TT
Io Note 3	dBm/9.36 MHz	Conf 1,2,3,4,5,6	-57.9+TT	-57.9+TT	-57.9+TT	-57.9+TT	-57.9+TT	-57.9+TT
	dBm/38.16 MHz	Conf 7,8,9	-51.8+TT	-51.8+TT	-51.8+TT	-51.8+TT	-51.8+TT	-51.8+TT
Propagation Condition		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	AWGN			AWGN		
Antenna configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	1 x 2			1 x 2		

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

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

NOTE 3: $\hat{E}_s/I_{ot}$, Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.5.4.1.5-2 : NR Cell specific test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on SCell (Cell 2)

Parameter	Unit	Test Configuration	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3

Channel number		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	3			3		
TDD configuration		Conf 1, 4, 7	N/A			N/A		
		Conf 2, 5, 8	TDDConf.1.1			TDDConf.1.1		
		Conf 3, 6, 9	TDDConf.2.1			TDDConf.2.1		
$BW_{channel}$	MHz	Conf 1, 4, 7	10: $N_{RB,c}$ = 52			10: $N_{RB,c}$ = 52		
		Conf 2, 5, 8	10: $N_{RB,c}$ = 52			10: $N_{RB,c}$ = 52		
		Conf 3, 6, 9	40: $N_{RB,c}$ = 106			40: $N_{RB,c}$ = 106		
PUSCH parameters for NR UL carrier		Conf 1, 4, 7	[TBD]	[TBD]	[TBD]	N/A	[TBD]	N/A
		Conf 2, 5, 8	[TBD]	[TBD]	[TBD]	N/A	[TBD]	N/A
		Conf 3, 6, 9	[TBD]	[TBD]	[TBD]	N/A	[TBD]	N/A
PUCCH parameters For NR UL carrier		Conf 1, 4, 7	[TBD]	[TBD]	[TBD]	N/A	[TBD]	N/A
		Conf 2, 5, 8	[TBD]	[TBD]	[TBD]	N/A	[TBD]	N/A
		Conf 3, 6, 9	[TBD]	[TBD]	[TBD]	N/A	[TBD]	N/A
PUSCH parameters for supplementary UL		Conf 1, 4, 7	N/A	[TBD]	N/A	[TBD]	[TBD]	[TBD]
		Conf 2, 5, 8	N/A	[TBD]	N/A	[TBD]	[TBD]	[TBD]
		Conf 3, 6, 9	N/A	[TBD]	N/A	[TBD]	[TBD]	[TBD]
PUCCH parameters for supplementary UL		Conf 1, 4, 7	N/A	[TBD]	N/A	[TBD]	[TBD]	[TBD]
		Conf 2, 5, 8	N/A	[TBD]	N/A	[TBD]	[TBD]	[TBD]
		Conf 3, 6, 9	N/A	[TBD]	N/A	[TBD]	[TBD]	[TBD]
PDSCH reference measurement channel as defined in A.3.1.1		Conf 1, 4, 7	SR.1.1 FDD			SR.1.1 FDD		
		Conf 2, 5, 8	SR.1.1 TDD			SR.1.1 TDD		
		Conf 3, 6, 9	SR 2.1 TDD			SR 2.1 TDD		
RMSI CORESET reference measurement channel as defined in A.3.1.2		Conf 1, 4, 7	CR.1.1 FDD			CR.1.1 FDD		
		Conf 2, 5, 8	CR.1.1 TDD			CR.1.1 TDD		
		Conf 3, 6, 9	CR.2.1 TDD			CR.2.1 TDD		
RMC CORESET reference measurement channel as defined in A.3.1.3		Conf 1, 4, 7	CCR.1.1 FDD			CCR.1.1 FDD		
		Conf 2, 5, 8	CCR.1.1 TDD			CCR.1.1 TDD		
		Conf 3, 6, 9	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern Note 1		Conf 1, 2, 3	OP.1			OP.1		
SSB configuration		Conf 1, 2, 4, 5, 7,8	SSB.1 FR1			SSB.1 FR1		
		Conf 3, 6, 9	SSB.2 FR1			SSB.2 FR1		
SMTC configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	SMTC.1			SMTC.1		
DL initial BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	DLBWP.0.1			DLBWP.0.1		
DL dedicated BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	DLBWP.1.1			DLBWP.1.1		
UL dedicated BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	ULBWP.1.1			ULBWP.1.1		
EPRE ratio of PSS to SSS	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	0			0		
EPRE ratio of PBCH_DMRS to SSS								
EPRE ratio of PBCH to PBCH_DMRS								
EPRE ratio of PDCCH_DMRS to SSS								
EPRE ratio of PDCCH to PDCCH_DMRS								
EPRE ratio of PDSCH_DMRS to SSS								
EPRE ratio of PDSCH to PDSCH_DMRS								

EPRE ratio of OCNG DMRS to SSS								
EPRE ratio of OCNG to OCNG DMRS								
N_{oc} Note 2	dBm / 15kHz	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	-102+TT			-102+TT		
	dBm/ SCS	Conf 1, 2, 4, 5, 7,8	-102+TT			-102+TT		
		Conf 3, 6, 9	-99+TT			-99+TT		
$\hat{E}_s/N_{oc}$	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16+TT	16+TT	16+TT	16+TT	16+TT	16+TT
$\hat{E}_s/I_{ot}$ Note 3	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16+TT	16+TT	16+TT	16+TT	16+TT	16+TT
SS-RSRP Note 3	dBm/ SCS	Conf 1, 2, 4, 5, 7,8	-86+TT	-86+TT	-86+TT	-86+TT	-86+TT	-86+TT
		Conf 3, 6, 9	-83+TT	-83+TT	-83+TT	-83+TT	-83+TT	-83+TT
Io Note 3	dBm/ 9.36 MHz	Conf 1, 2, 4, 5, 7,8	-57.9+TT	-57.9+TT	-57.9+TT	-57.9+TT	-57.9+TT	-57.9+TT
	dBm/ 38.16 MHz	Conf 3, 6, 9	-51.8+TT	-51.8+TT	-51.8+TT	-51.8+TT	-51.8+TT	-51.8+TT
Propagation Condition		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	AWGN			AWGN		
Antenna configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	1 x 2			1 x 2		

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

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

NOTE 3: $\hat{E}_s/I_{ot}$, Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

In test 1 the UE shall be ready to start transmission on the supplementary uplink carrier on SCell within [20] ms from the start of T2.

In test 1 the UE shall stop the transmission on the supplementary uplink carrier on SCell within [20] ms from the start of T3.

In test 2 the UE shall be ready to start transmission on the NR uplink carrier on SCell within [20] ms from the start of T2.

In test 2 the UE shall stop the transmission on the NR uplink carrier on SCell within [20] ms from the start of T3.

All of the above test requirements shall be fulfilled in order for the observed UE UL carrier configuration delay and UE UL carrier release delay to be counted as correct. The rate of correct observed UE UL carrier configuration delay and UE UL carrier release delay during repeated tests shall be at least 90%.

6.5.5 Link recovery procedures

6.5.5.3 NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- Test requirements are between brackets.

- Some parameters are TBD

6.5.5.3.1 Test purpose

The purpose of this test is:

To verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set q_1.

To test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used.

To partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

6.5.5.3.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

6.5.5.3.3 Minimum conformance requirements

[TS 38.133 [6], clause 8.5.3.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured CSI-RS resource in set $\overline{q}_0$ estimated over the last $T_{Evaluate\_BFD\_CSI-RS}$ [ms] period becomes worse than the threshold $Q_{out\_LR\_CSI-RS}$ within $T_{Evaluate\_BFD\_CSI-RS}$ [ms] period.

The value of $T_{Evaluate\_BFD\_CSI-RS}$ is defined in Table 6.5.5.3.3-1.

For FR1,

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

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

Longer evaluation period would be expected if the combination of BFD-RS and measurement gap configurations does not meet pervious conditions.

The values of M_{BFD} used in Table 6.5.5.3.3-1 is defined as

- M_{BFD} = 10, if the CSI-RS resource configured for BFD is transmitted with Density = 3.

Table 6.5.5.3.3-1: Evaluation period $T_{Evaluate\_BFD\_CSI-RS}$ for FR1

Configuration	$T_{Evaluate\_BFD\_CSI-RS}$ (ms)
no DRX	max([50], [M_{BFD} *P] * T_{CSI-RS})
DRX cycle ≤ 320ms	max([50], [1.5×M_{BFD} *P]*max(T_{DRX}, T_{CSI-RS}))
DRX cycle > 320ms	[M_{BFD}*P] * T_{DRX}
Note: T_{CSI-RS} is the periodicity of CSI-RS resource in the set $\overline{q}_0$. T_{DRX} is the DRX cycle length.	

[TS 38.133 [6], clause 8.5.4]

When the radio link quality on all the configured RS resources in set $\overline{q}_0$ is worse than Q_{out_LR}, Layer 1 of the UE shall send a beam failure instance indication to the higher layers. A Layer 3 filter may be applied to the beam failure instance indications as specified in TS 38.331 [13].

The beam failure instance evaluation for the configured RS resources in set $\overline{q}_0$ shall be performed as specified in section 6 in TS 38.213 [8]. Two successive indications from Layer 1 shall be separated by at least $T_{Indication\_interval\_BFD}$.

When DRX is not used, $T_{Indication\_interval\_BFD}$ is max(2ms, $T_{BFD-RS,M}$), where $T_{BFD-RS,M}$ is the shortest periodicity of all configured RS resources in set $\overline{q}_0$ for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set $\overline{q}_0$ or CSI-RS resource in the set $\overline{q}_0$.

When DRX is used, $T_{Indication\_interval\_BFD}$ is max(1.5*DRX_cycle_length, 1.5*$T_{BFD-RS,M}$) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication\_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms.[TS 38.133 [6], clause 8.5.6.2]

UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in set $\overline{q}_1$ estimated over the last $T_{Evaluate\_CBD\_CSI-RS}$ [ms] period becomes better than the threshold Q_{in_LR} within $T_{Evaluate\_CBD\_CSI-RS}$ [ms] period.

The value of $T_{Evaluate\_CBD\_CSI-RS}$ is defined in Table 6.5.5.3.3-2.

For FR1,

- P=1/(1 – T_{CSI-RS}/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

The values of M_{CBD} used in Table 6.5.5.3.3-2 is defined as

- M_{CBD} = 3, if the CSI-RS resource configured in the set $\overline{q}_1$ is transmitted with Density = 3.

Table 6.5.5.3.3-2: Evaluation period $T_{Evaluate\_CBD\_CSI-RS}$ for FR1

Configuration	$T_{Evaluate\_CBD\_CSI-RS}$ (ms)
non-DRX	max(TBD, ceil(M_{CBD} *P) * T_{CSI-RS})
DRX cycle ≤ 320ms	ceil(M_{CBD} *P*N) * max(T_{DRX}, T_{CSI-RS})
DRX cycle > 320ms	ceil(M_{CBD} *P) *T_{DRX}
Note: T_{CSI-RS} is the periodicity of CSI-RS resource in the set $\overline{q}_1$. T_{DRX} is the DRX cycle length.	

The normative reference for this requirement is TS 38.133 [6] clauses 8.5.3.2, 8.5.4, 8.5.6.2 and A.6.5.5.3.

6.5.5.3.4 Test description

The test consists of two subtests with one NR serving cell configured. The difference between the two subtests is whether the measurement gap is configured on the NR serving Cell or not. Each subtest consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.3.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate CSI-RS based beam failure.

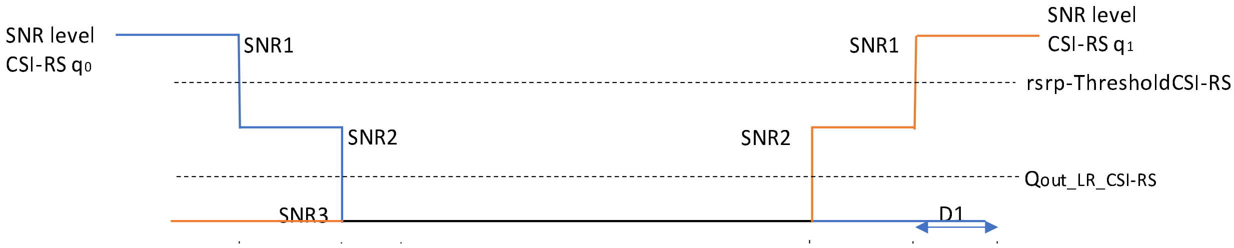


Figure 6.5.5.3.4-1: SNR variation CSI-RS for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

6.5.5.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.3.4.1-1.

Table 6.5.5.3.4.1-1: Supported test configurations for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Configuration	Description
1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
3	FDD duplex mode, 30kHz SSB SCS, 40MHz bandwidth
4	TDD duplex mode, 30kHz SSB SCS, 40MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.3.4.1-2.

Table 6.5.5.3.4.1-2: Initial conditions for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.5.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.5.5.3.4.1-3. The measurement gap configuration for sub-test 2 is according to Table 6.5.5.3.4.1-4. The NZP-CSI-RS configuration for sub-test 1 and 2 is according to Table 6.5.5.3.4.1-5.

2. Message contents are defined in clause 6.5.5.3.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.5.5.3.4.1-3: General test parameters for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Parameter		Unit	Value Test 1	Value Test 2	Comment
Active PCell			Cell 1	Cell 1	
RF Channel Number			1	1	
Duplex mode	Config 1, 3		FDD	FDD	
	Config 2, 4		TDD	TDD	
TDD Configuration	Config 1, 3		Not Applicable	Not Applicable	
	Config 2		[TDDConf.1.1]	[TDDConf.1.1]	
	Config 4		[TDDConf.1.2]	[TDDConf.1.2]	
CORESET Reference Channel	Config 1		[CR. 1.1 FDD]	[CR. 1.1 FDD]	A.3.1.2
	Config 2		[CR. 1.1 TDD]	[CR. 1.1 TDD]	
	Config 3		[CR. 2.1 FDD]	[CR. 2.1 FDD]	
	Config 4		[CR. 2.1 TDD]	[CR. 2.1 TDD]	
SSB Configuration	Config 1		**SSB.1 FR1**	SSB.1 FR1	A.3.10
	Config 2		SSB.1 FR1	SSB.1 FR1	
	Config 3		**SSB.2 FR1**	SSB.2 FR1	
	Config 4		SSB.2 FR1	SSB.2 FR1	
SMTC Configuration	Config 1, 2		FR1 patterm 1	FR1 patterm 1	A.3.11
	Config 3, 4		FR1 patterm 2	FR1 patterm 2	
PDSCH/ PDCCH subcarrier spacing	Config 1, 2		15 KHz	15 KHz	
	Config 3, 4		30 KHz	30 KHz	
csi-RS-Index assigned as beam failure RS			[0]	[0]	
OCNG parameters			TBD	TBD	A.3.2.1
CP length			Normal	Normal	
Correlation Matrix and Antenna Configuration			[2x2 Low]	[2x2 Low]	
Beam failure detection transmission parameters	DCI format		1-0	1-0	
	Number of Control OFDM symbols		2	2	
	Aggregation level	CCE	8	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	0	
	DMRS precoder granularity		REG bundle size	REG bundle size	
	REG bundle size		6	6	
DRX			OFF	OFF	
Gap pattern ID			[N.A.]	*[*gp0*]	

csi-RS-Index			2	2	Number of SSB indexes used for beam failure detection
rlmInSyncOutOfSync Threshold			absent	absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).
rsrp-ThresholdSSB			TBD	TBD	Threshold used for $Q_{out\_LR\_SSB}$
powerControlOffsetSS			db0	db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstance MaxCount			n2	n2	see TS 38.321 [7], section 5.17
beamFailureDetection Timer			pbfd4	pbfd4	see TS 38.321 [7], section 5.17
NZP CSI-RS configuration			[ResourceId 1]	[ResourceId 0]	
ZP CSI-RS configuation			TBD	TBD	
Periodic CSI reporting			PUCCH	PUCCH	
CSI reporting periodicity	Config 1, 2	slot	[5]	[5]	
	Config 3		[10]	[10]	
T1		s	1	1	During this time the UE shall be fully synchronized to cell 1
T2		s	0.4	0.4	
T3		s	[TBD]	[TBD]	
D1		s	[0.24]	[0.44]	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.					

Table 6.5.5.3.4.1-4: Measurement gap configuration for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Field	Test 2
	Value
gapOffset	[0]

Table 6.5.5.3.4.1-5: NZP-CSI-RS resource configuration for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Field	ResourceId 0	ResourceId 1
	Value	Value
frequencyDomainAllocation Note 1	row1	row2
startingRB	0	0
nrofRBs	Note 2	Note 2
Note 1: TS 38.211 [6] table 7.4.1.5.3-1 Note 2: nrofRBs is derived based on the Configuration in TS 38.133 [6] Table A.4.5.1.7.1-1		

6.5.5.3.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in subtest 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters of NR Cell 1 according to T1 in Table 6.5.5.3.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.5.3.5-1. T2 starts.
4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.5.3.5-1. T3 starts.
5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.5.3.5-1. T4 starts.
6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.5.3.5-1. T5 starts.
7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect any uplink power on NR carrier higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C until T3 expires

   and

   c) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point F (D1 after the start of T5) until T5 expires,

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 6.5.5.3.5-1.
9. Wait [1s] for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within [1s] continue to step 11. Otherwise continue to step 10.
10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.
11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.5.5.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.5.5.3.4.3-1: Common Exception messages for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	TBD

6.5.5.3.5 Test requirement

Tables 6.5.5.3.4.1-3 and 6.5.5.3.5-1 define the primary level settings including test tolerances for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX.

Table 6.5.5.3.5-1: NR Cell specific test parameters for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

<table>
<tr><th colspan="2" rowspan="3">Parameter</th><th rowspan="3">Unit</th><th colspan="5">Test 1 and Test 2</th><th colspan="5">Test 1 and Test 2</th></tr>
<tr><th colspan="5">CSI-RS of set q_0</th><th colspan="5">CSI-RS of set q_1</th></tr>
<tr><th>T1</th><th>T2</th><th>T3</th><th>T4</th><th>T5</th><th>T1</th><th>T2</th><th>T3</th><th>T4</th><th>T5</th></tr>
<tr><td colspan="2">EPRE ratio of PSS to SSS</td><td>dB</td><td colspan="5" rowspan="9">0</td><td colspan="5" rowspan="9">0</td></tr>
<tr><td colspan="2">EPRE ratio of PBCH DMRS to SSS</td><td>dB</td></tr>
<tr><td colspan="2">EPRE ratio of PBCH to PBCH DMRS</td><td>dB</td></tr>
<tr><td colspan="2">EPRE ratio of PDCCH DMRS to SSS</td><td>dB</td></tr>
<tr><td colspan="2">EPRE ratio of PDCCH to PDCCH DMRS</td><td>dB</td></tr>
<tr><td colspan="2">EPRE ratio of PDSCH DMRS to SSS</td><td>dB</td></tr>
<tr><td colspan="2">EPRE ratio of PDSCH to PDSCH DMRS</td><td>dB</td></tr>
<tr><td colspan="2">EPRE ratio of OCNG DMRS to SSS(Note 1)</td><td>dB</td></tr>
<tr><td colspan="2">EPRE ratio of OCNG to OCNG DMRS (Note 1)</td><td>dB</td></tr>
<tr><td rowspan="3">SNR_CSI-RS</td><td>Config 1</td><td rowspan="3">dB</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td></tr>
<tr><td>Config 2</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td></tr>
<tr><td>Config 3</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td></tr>
<tr><td rowspan="3">N_{oc}</td><td>Config 1</td><td rowspan="3">dBm/15KHz</td><td colspan="5">[-98]</td><td colspan="5">[-98]</td></tr>
<tr><td>Config 2</td><td colspan="5">[-98]</td><td colspan="5">[-98]</td></tr>
<tr><td>Config 3</td><td colspan="5">[-98]</td><td colspan="5">[-98]</td></tr>
<tr><td>SS-RSRP Note 3</td><td></td><td>dBm/SCS</td><td colspan="5"></td><td colspan="5"></td></tr>
<tr><td>Ês/Iot</td><td></td><td></td><td colspan="5"></td><td colspan="5"></td></tr>
<tr><td>Ês/Noc</td><td></td><td></td><td colspan="5"></td><td colspan="5"></td></tr>
<tr><td rowspan="2">Io</td><td>config 1, 2</td><td>dBm/9.36 MHz</td><td colspan="5"></td><td colspan="5"></td></tr>
<tr><td>Config 3, 4</td><td>dBm/38.1 MHz</td><td colspan="5"></td><td colspan="5"></td></tr>
<tr><td colspan="2">Propagation condition</td><td></td><td colspan="5">[TDLC300]</td><td colspan="5">[TDLC300]</td></tr>
<tr><td colspan="13">Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</td></tr>
</table>

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

6.5.5.4 NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- Test requirements are between brackets.

- Some parameters are TBD

6.5.5.4.1 Test purpose

The purpose of this test is:

To verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set q_1.

To test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used.

To partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

6.5.5.4.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

6.5.5.4.3 Minimum conformance requirements

[TS 38.133 [6], clause 8.5.3.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured CSI-RS resource in set $\overline{q}_0$ estimated over the last $T_{Evaluate\_BFD\_CSI-RS}$ [ms] period becomes worse than the threshold $Q_{out\_LR\_CSI-RS}$ within $T_{Evaluate\_BFD\_CSI-RS}$ [ms] period.

The value of $T_{Evaluate\_BFD\_CSI-RS}$ is defined in Table 6.5.5.4.3-1.

For FR1,

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

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

Longer evaluation period would be expected if the combination of BFD-RS and measurement gap configurations does not meet pervious conditions.

The values of M_{BFD} used in Table 6.5.5.4.3-1 is defined as

- M_{BFD} = 10, if the CSI-RS resource configured for BFD is transmitted with Density = 3.

Table 6.5.5.4.3-1: Evaluation period $T_{Evaluate\_BFD\_CSI-RS}$ for FR1

Configuration	$T_{Evaluate\_BFD\_CSI-RS}$ (ms)
no DRX	max([50], [M_{BFD} *P] * T_{CSI-RS})
DRX cycle ≤ 320ms	max([50], [1.5×M_{BFD} *P]*max(T_{DRX}, T_{CSI-RS}))
DRX cycle > 320ms	[M_{BFD}*P] * T_{DRX}
Note: T_{CSI-RS} is the periodicity of CSI-RS resource in the set $\overline{q}_0$. T_{DRX} is the DRX cycle length.	

[TS 38.133 [6], clause 8.5.4]

When the radio link quality on all the configured RS resources in set $\overline{q}_0$ is worse than Q_{out_LR}, Layer 1 of the UE shall send a beam failure instance indication to the higher layers. A Layer 3 filter may be applied to the beam failure instance indications as specified in TS 38.331 [13].

The beam failure instance evaluation for the configured RS resources in set $\overline{q}_0$ shall be performed as specified in section 6 in TS 38.213 [8]. Two successive indications from Layer 1 shall be separated by at least $T_{Indication\_interval\_BFD}$.

When DRX is not used, $T_{Indication\_interval\_BFD}$ is max(2ms, $T_{BFD-RS,M}$), where $T_{BFD-RS,M}$ is the shortest periodicity of all configured RS resources in set $\overline{q}_0$ for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set $\overline{q}_0$ or CSI-RS resource in the set $\overline{q}_0$.

When DRX is used, $T_{Indication\_interval\_BFD}$ is max(1.5*DRX_cycle_length, 1.5*$T_{BFD-RS,M}$) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication\_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms.[TS 38.133 [6], clause 8.5.6.2]

UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in set $\overline{q}_1$ estimated over the last $T_{Evaluate\_CBD\_CSI-RS}$ [ms] period becomes better than the threshold Q_{in_LR} within $T_{Evaluate\_CBD\_CSI-RS}$ [ms] period.

The value of $T_{Evaluate\_CBD\_CSI-RS}$ is defined in Table 6.5.5.4.3-2.

For FR1,

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

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

The values of M_{CBD} used in Table 6.5.5.4.3-2 is defined as

- M_{CBD} = 3, if the CSI-RS resource configured in the set $\overline{q}_1$ is transmitted with Density = 3.

Table 6.5.5.4.3-2: Evaluation period $T_{Evaluate\_CBD\_CSI-RS}$ for FR1

Configuration	$T_{Evaluate\_CBD\_CSI-RS}$ (ms)
non-DRX	max(TBD, ceil(M_{CBD} *P) * T_{CSI-RS})
DRX cycle ≤ 320ms	ceil(M_{CBD} *P*N) * max(T_{DRX}, T_{CSI-RS})
DRX cycle > 320ms	ceil(M_{CBD} *P) *T_{DRX}
Note: T_{CSI-RS} is the periodicity of CSI-RS resource in the set $\overline{q}_1$. T_{DRX} is the DRX cycle length.	

The normative reference for this requirement is TS 38.133 [6] clauses 8.5.3.2, 8.5.4, 8.5.6.2 and A.6.5.5.3.

6.5.5.4.4 Test description

The test consists of two subtests with one NR serving cell configured. The difference between the two subtests is whether the measurement gap is configured on the NR serving Cell or not. Each subtest consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.4.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate CSI-RS based beam failure.

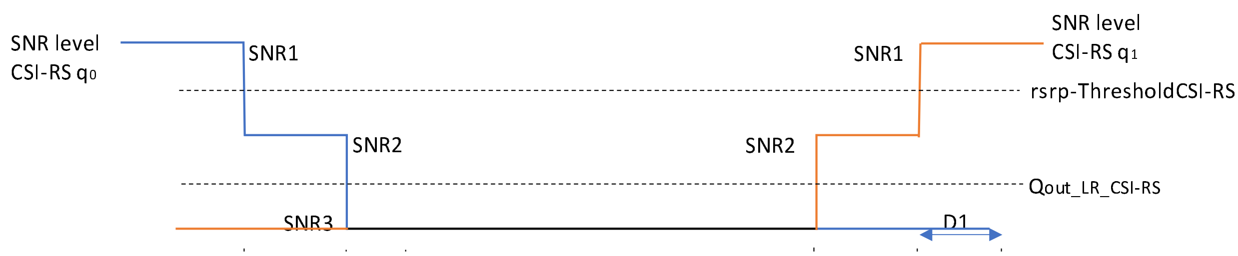


Figure 6.5.5.4.4-1: SNR variation CSI-RS for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

6.5.5.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.4.4.1-1.

Table 6.5.5.4.4.1-1: Supported test configurations for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

Configuration	Description
1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
3	FDD duplex mode, 30kHz SSB SCS, 40MHz bandwidth
4	TDD duplex mode, 30kHz SSB SCS, 40MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.4.4.1-2.

Table 6.5.5.4.4.1-2: Initial conditions for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.5.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.5.5.4.4.1-3. The measurement gap configuration for sub-test 2 is according to Table 6.5.5.4.4.1-4. The NZP-CSI-RS configuration for sub-test 1 and 2 is according to Table 6.5.5.4.4.1-5. The DRX configuration for subtest 1 and 2 is according to Table 6.5.5.4.4.1-6. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

2. Message contents are defined in clause 6.5.5.4.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.5.5.4.4.1-3: General test parameters for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

Parameter		Unit	Value		Comment
			Test 1	Test 2	
Active PCell			Cell 1	Cell 1	
RF Channel Number			1	1	
Duplex mode	Config 1, 3		FDD	FDD	
	Config 2, 4		TDD	TDD	
TDD Configuration	Config 1, 3		Not Applicable	Not Applicable	
	Config 2		[TDDConf.1.1]	[TDDConf.1.1]	
	Config 3		[TDDConf.1.2]	[TDDConf.1.2]	
CORESET Reference Channel	Config 1		[CR. 1.1 FDD]	[CR. 1.1 FDD]	A.3.1.2
	Config 2		[CR. 1.1 TDD]	[CR. 1.1 TDD]	
	Config 3		[CR. 2.1 FDD]	[CR. 2.1 FDD]	
	Config 4		[CR. 2.1 TDD]	[CR. 2.1 TDD]	
SSB Configuration	Config 1		SSB.1 FR1	SSB.1 FR1	A.3.10
	Config 2		SSB.1 FR1	SSB.1 FR1	
	Config 3		SSB.2 FR1	SSB.2 FR1	A.3.11
	Config 4		SSB.2 FR1	SSB.2 FR1	
SMTC Configuration	Config 1, 2		FR1 patterm 1	FR1 patterm 1	
	Config 3, 4		FR1 patterm 2	FR1 patterm 2	
PDSCH/ PDCCH subcarrier spacing	Config 1, 2		15 KHz	15 KHz	
	Config 3, 4		30 KHz	30 KHz	
csi-RS-Index assigned as Beam Failure RS			[0]	[0]	
OCNG parameters			TBD	TBD	A.3.2.1
CP length			Normal	Normal	
Correlation Matrix and Antenna Configuration			[2x2 Low]	[2x2 Low]	
Beam failure detection trans mission parameters	DCI format		1-0	1-0	
	Number of Control OFDM symbols		2	2	
	Aggregation level	CCE	8	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	0	
	DMRS precoder granularity		REG bundle size	REG bundle size	
	REG bundle size		6	6	
DRX			640	640	
Gap pattern ID			[N.A.]	*[*gp0*]	

csi-RS-Index			2	2	Number of SSB indexes used for beam failure detection
rlmInSyncOutOfSync Threshold			absent	absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).
rsrp-ThresholdSSB			TBD	TBD	Threshold used for $Q_{out\_LR\_SSB}$
powerControlOffsetSS			db0	db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstance MaxCount			[n2]	[n2]	see TS 38.321 [7], section 5.17
beamFailureDetection Timer			[pbfd4]	[pbfd4]	see TS 38.321 [7], section 5.17
NZP CSI-RS configuration			[ResourceId 1]	[ResourceId 0]	
ZP CSI-RS configuation			TBD	TBD	
Periodic CSI reporting			PUCCH	PUCCH	
CSI reporting periodicity	Config 1, 2	slot	[5]	[5]	
	Config 3		[10]	[10]	
T1		s	1	1	During this time the UE shall be fully synchronized to cell 1
T2		s	0.4	0.4	
T3		s	[TBD]	[TBD]	
D1		s	[0.24]	[0.44]	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.					

Table 6.5.5.4.4.1-4: Measurement gap configuration for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

Field	Test 2
	Value
gapOffset	[0]

Table 6.5.5.4.4.1-5: NZP-CSI-RS resource configuration for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

Field	ResourceId 0	ResourceId 1
	Value	Value
frequencyDomainAllocation Note 1	row1	row2
startingRB	0	0
nrofRBs	Note 2	Note 2
Note 1: TS 38.211 [6] table 7.4.1.5.3-1 Note 2: nrofRBs is derived based on the Configuration in TS 38.133 [6] Table A.4.5.1.7.1-1		

Table A.6.5.5.4.1-6: DRX-Configuration for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

Field	Test 5	Test 6
	Value	Value
drx-onDurationTimer	[ms6]	[ms6]
drx-InactivityTimer	[ms1]	[ms1]
drx-RetransmissionTimerDL	[sl1]	[sl1]
drx-RetransmissionTimerUL	[sl1]	[sl1]
longDRX-CycleStartOffset	[ms640]	[ms40]
shortDRX	disable	disable

6.5.5.4.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in subtest 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 6.5.5.3.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.5.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.5.4.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.5.4.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.5.4.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect any uplink power on NR carrier higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C until T3 expires

   and

   c) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point F (D1 after the start of T5) until T5 expires,

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 6.5.5.4.5-1.

9. Wait [1s] for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within [1s] continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

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

6.5.5.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.5.5.4.4.3-1: Common Exception messages for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	TBD

6.5.5.4.5 Test requirement

Tables 6.5.5.4.4.1-3 and 6.5.5.4.5-1 define the primary level settings including test tolerances for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX.

Table 6.5.5.4.5-1: NR Cell specific test parameters for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

Parameter		Unit	Test 1 and Test 2					Test 1 and Test 2				
			CSI-RS of set q_0					CSI-RS of set q_1				
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
EPRE ratio of PSS to SSS		dB	0					0				
EPRE ratio of PBCH DMRS to SSS		dB										
EPRE ratio of PBCH to PBCH DMRS		dB										
EPRE ratio of PDCCH DMRS to SSS		dB										
EPRE ratio of PDCCH to PDCCH DMRS		dB										
EPRE ratio of PDSCH DMRS to SSS		dB										
EPRE ratio of PDSCH to PDSCH DMRS		dB										
EPRE ratio of OCNG DMRS to SSS(Note 1)		dB										
EPRE ratio of OCNG to OCNG DMRS (Note 1)		dB										
SNR_CSI-RS	Config 1	dB	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Config 2		TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Config 3		TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N_{oc}	Config 1	dBm/15KHz	[-98]					[-98]				
	Config 2		[-98]					[-98]				
	Config 3		[-98]					[-98]				
SS-RSRP Note 3		dBm/SCS										
$\hat{E}_s/I_{ot}$												
$\hat{E}_s/N_{oc}$												
Io	config 1, 2	dBm/9.36 MHz										
	Config 3, 4	dBm/38.1 MHz										
Propagation condition			[TDLC300]					[TDLC300]				
Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.												

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

6.5.6 Active BWP switch delay

6.5.6.1 DCI-based and time-based active BWP switch

6.5.6.1.0 Minimum conformance requirements

FFS

6.5.6.1.1 NR SA FR1 DCI-based DL active BWP switch in non-DRX

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

6.5.6.1.1.1 Test purpose

FFS

6.5.6.1.1.2 Test applicability

FFS

6.5.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.6.1.1.

6.5.6.1.1.4 Test description

6.5.6.1.1.4.1 Initial conditions

FFS

6.5.6.1.1.4.2 Test procedure

FFS

6.5.6.1.1.4.3 Message contents

FFS

6.5.6.1.1.5 Test requirements

FFS

6.5.6.2 RRC-based active BWP switch

6.5.6.2.0 Minimum conformance requirements

FFS

6.5.6.2.1 NR SA FR1 RRC-based DL active BWP switch in non-DRX

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

6.5.6.2.1.1 Test purpose

FFS

6.5.6.2.1.2 Test applicability

FFS

6.5.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.6.2.1.

6.5.6.2.1.4 Test description

6.5.6.2.1.4.1 Initial conditions

FFS

6.5.6.2.1.4.2 Test procedure

FFS

6.5.6.2.1.4.3 Message contents

FFS

6.5.6.2.1.5 Test requirements

FFS

6.6 Measurement procedures

6.6.1 Intra-frequency measurements

6.6.1.0 Minimum conformance requirements

6.6.1.0.1 Minimum conformance requirements for event-triggered measurement without gap

[TS 38.133, clause 9.2.5.1 and 9.2.5.2]

The UE shall be able to identify a new detectable intra frequency cell within $T_{identify\_intra\_without\_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within $T_{identify\_intra\_without\_index.}$ It is assumed that *deriveSSB-IndexFromCell*is always enabled for FR1 TDD and FR2.

$$T_{identify\_intra\_without\_index} = (T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra})\ ms$$

Where:

T_{PSS/SSS_sync_intr}: it is the time period used in PSS/SSS detection given in table 6.6.1.2.3-1.

$T_{SSB\_measurement\_period\_intra}$: equal to a measurement period of SSB based measurement given in table 6.6.1.2.3-2.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{outside\_gap,i}$ in TS 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gaps.

When intrafrequency SMTC is fully non overlapping with measurement gaps, Kp=1. When intrafrequency SMTC is partially overlapping with measurent gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP.

Table 6.6.1.0.1-1: Time period for PSS/SSS detection (Frequency range FR1)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max[600ms, ceil([5] x K_p) x SMTC period]$^{Note\ 1}$ x $CSSF_{intra}$
DRX cycle≤ 320ms	max[600ms, ceil(1.5x [5] x K_p) x max(SMTC period,DRX cycle)] x $CSSF_{intra}$
DRX cycle>320ms	Ceil([5] x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

Table 6.6.1.0.1-2: Measurement period for intra-frequency measurements without gaps (Frequency Range FR1)

DRX cycle	$T_{SSB\_measurement\_period\_intra}$
No DRX	max[200ms, ceil(5 x K_p) x SMTC period]$^{Note\ 1}$ x $CSSF_{intra}$
DRX cycle≤ 320ms	max[200ms, ceil(1.5x 5 x K_p) x max(SMTC period,DRX cycle)] x $CSSF_{intra}$
DRX cycle>320ms	ceil(5 x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

[TS 38.133, clause 9.2.4.3]

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in TS 38.133 [6] clause 10.1.2.1, 10.1.7.1 and 10.1.12.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}.This measurement reporting delay excludes a delay which caused by no UL resoureces for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify\ intra\ without\ index}$ defined in TS 38.133 [6] clause 9.2.5.1. When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period than $T_{identify\ intra\ without\ index}$ defined in TS 38.133 [6] clause 9.2.5.1 becomes undetectable for a period and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than $T_{Measurement\_Period,\ Intra}$ provided the timing to that cell has not changed more than 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 9.2.2]

The requirements given above apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] sections 10.1.2 are fulfilled for a corresponding Band,
- SS-RSRQ related side conditions given in TS 38.133 [6] sections 10.1.7 are fulfilled for a corresponding Band,
- SS-SINR related side conditions given in TS 38.133 [6] sections 10.1.12 are fulfilled for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 9.2.2, 9.2.4.3, 9.2.5.1 and 9.2.5.2.

6.6.1.0.2 Minimum conformance requirements for event-triggered measurement with gap

[TS 38.133 [6], clause 9.2.6.2, 9.2.6.3]

The UE shall be able to identify a new detectable intra frequency cell within $T_{identify\_intra\_without\_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify\_intra\_without\_index} = T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra}\ \text{ms}$$

Where:

T_{PSS/SSS_sync_intra}: it is the time period used in PSS/SSS detection given in table 6.6.1.0.2-1.

$T_{SSB\_measurement\_period\_intra}$: equal to a measurement period of SSB based measurement given in table 6.6.1.0.2-2.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within\_gap,i}$ in TS 38.133 [6] section 9.1.5.2.2 for measurement conducted outside measurement gaps.

Table 6.6.1.0.2-1: Time period for PSS/SSS detection (Frequency range FR1)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max[600ms, [5] x max(MGRP, SMTC period)] x $CSSF_{intra}$
DRX cycle≤ 320ms	max[600ms, ceil(1.5x [5]) x max(MGRP, SMTC period,DRX cycle)] x $CSSF_{intra}$
DRX cycle>320ms	[5] x max(MGRP, DRX cycle) x $CSSF_{intra}$

Table 6.6.1.0.2-2: Measurement period for intra-frequency measurements with gaps (Frequency Range FR1)

DRX cycle	$T_{SSB\_measurement\_period\_intra}$
No DRX	max[200ms, 5 x max(MGRP, SMTC period)] x $CSSF_{intra}$
DRX cycle≤ 320ms	max[200ms, ceil(1.5x 5) x max(MGRP, SMTC period,DRX cycle)] x $CSSF_{intra}$
DRX cycle>320ms	5 x max(MGRP, DRX cycle) x $CSSF_{intra}$

[TS 38.133 [6], clause 9.2.2]

The requirements given above apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] sections 10.1.2 are fulfilled for a corresponding Band,
- SS-RSRQ related side conditions given in TS 38.133 [6] sections 10.1.7 are fulfilled for a corresponding Band,
- SS-SINR related side conditions given in TS 38.133 [6] Sections 10.1.12 are fulfilled for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

[TS 38.133 [6], clause 9.2.4.2]

The RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.2.1.1 and 10.1.2.1.2, the RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.7.1.1, and the SINR measurement accuracy for all measured cells shall be as specified in the TS 38.133 [6] clause 10.1.12.1.1.

Reported RSRP, RSRQ and SINR measurements contained in event triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1.2.1.1, 10.1.2.1.2, 10.1.7.1.1 and 10.1.12.1.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify\_intra\_without\_index}$ defined in TS 38.133 [6] section 9.2.6.2. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2.2, 9.2.4.2, 9.2.6.2 and 9.2.6.3.

6.6.1.0.3 Minimum conformance requirements for event-triggered measurement without gap with SSB index reading

[TS 38.133 [6], clause 9.2.5.1, 9.2.5.2]

UE shall be able to identify a new detectable intra frequency cell within $T_{identify\_intra\_with\_index}$.

$$T_{identify\_intra\_with\_index} = T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra} + T_{SSB\_time\_index\_intra} \text{ ms}$$

Where:

T_{PSS/SSS_sync_intra}: it is the time period used in PSS/SSS detection given in table 6.6.1.0.3-1.

$T_{SSB\_time\_index\_intra}$: it is the time period used to acquire the index of the SSB being measured given in table 6.6.1.0.3-2.

$T_{SSB\_measurement\_period\_intra}$: equal to a measurement period of SSB based measurement given in table 6.6.1.0.3-3.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{outside\_gap,i}$ in TS 38.133 [6] section 9.1.5.1 for measurement conducted outside measurement gaps

Table 6.6.1.0.3-1: Time period for PSS/SSS detection (Frequency range FR1)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max[600ms, ceil([5] x K_p) x SMTC period]$^{Note\ 1}$ x $CSSF_{intra}$
DRX cycle≤ 320ms	max[600ms, ceil(1.5x [5] x K_p) x max(SMTC period,DRX cycle)] x $CSSF_{intra}$
DRX cycle>320ms	Ceil([5] x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

Table 6.6.1.0.3-2: Time period for time index detection (Frequency range FR1)

DRX cycle	$T_{SSB\_time\_index\_intra}$
No DRX	max[120ms, ceil(3 x K_p) x SMTC period]$^{Note\ 1}$ x $CSSF_{intra}$
DRX cycle≤ 320ms	max[120ms, ceil (1.5 x 3 x K_p) x max(SMTC period,DRX cycle)] x $CSSF_{intra}$
DRX cycle>320ms	Ceil(3 x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

Table 6.6.1.0.3-3: Measurement period for intra-frequency measurements with gaps (Frequency Range FR1)

DRX cycle	$T_{SSB\_measurement\_period\_intra}$
No DRX	max[200ms, ceil(5 x K_p) x SMTC period]$^{Note\ 1}$ x $CSSF_{intra}$
DRX cycle≤ 320ms	max[200ms, ceil(1.5x 5 x K_p) x max(SMTC period,DRX cycle)] x $CSSF_{intra}$
DRX cycle>320ms	ceil(5 x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

[TS 38.133 [6], clause 9.2.2]

The requirements given above apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] sections 10.1.2 are fulfilled for a corresponding Band,
- SS-RSRQ related side conditions given in TS 38.133 [6] sections 10.1.7 are fulfilled for a corresponding Band,
- SS-SINR related side conditions given in TS 38.133 [6] Sections 10.1.12 are fulfilled for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

[TS 38.133 [6], clause 9.2.4.2]

The RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.2.1.1 and 10.1.2.1.2, the RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.7.1.1, and the SINR measurement accuracy for all measured cells shall be as specified in the TS 38.133 [6] clause 10.1.12.1.1.

Reported RSRP, RSRQ and SINR measurements contained in event triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1.2.1.1, 10.1.2.1.2, 10.1.7.1.1 and 10.1.12.1.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify\_intra\_with\_index}$ defined in TS 38.133 [6] section 9.2.5.1. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2.2, 9.2.4.2, 9.2.5.1 and 9.2.5.2.

6.6.1.0.4 Minimum conformance requirements for event-triggered measurement with gap with SSB index reading

[TS 38.133 [6], clause 9.2.6.2, 9.2.6.3]

UE shall be able to identify a new detectable intra frequency cell within $T_{identify\_intra\_with\_index}$.

$$T_{identify\_intra\_with\_index} = T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra} + T_{SSB\_time\_index\_intra} \text{ ms}$$

Where:

T_{PSS/SSS_sync_intra}: it is the time period used in PSS/SSS detection given in table 6.6.1.6.3-1.

$T_{SSB\_time\_index\_intra}$: it is the time period used to acquire the index of the SSB being measured given in table 6.6.1.0.4-2.

$T_{SSB\_measurement\_period\_intra}$: equal to a measurement period of SSB based measurement given in table 6.6.1.0.4-3.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within\_gap,\ i}$ in TS 38.133 section 9.1.5.2.2 for measurement conducted within measurement gaps.

Table 6.6.1.0.4-1: Time period for PSS/SSS detection (Frequency range FR1)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max[600ms, [5] x max(MGRP, SMTC period)] x $CSSF_{intra}$
DRX cycle≤ 320ms	max[600ms, ceil(1.5x [5]) x max(MGRP, SMTC period,DRX cycle)] x $CSSF_{intra}$
DRX cycle>320ms	[5] x max(MGRP, DRX cycle) x $CSSF_{intra}$

Table 6.6.1.0.4-2: Time period for time index detection (Frequency range FR1)

DRX cycle	$T_{SSB\_time\_index\_intra}$
No DRX	max[120ms, ceil(3 x K_p) x SMTC period]$^{\text{Note 1}}$ x $CSSF_{intra}$
DRX cycle≤ 320ms	max[120ms, ceil (1.5 x 3 x K_p) x max(SMTC period,DRX cycle)] x $CSSF_{intra}$
DRX cycle>320ms	Ceil(3 x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

Table 6.6.1.0.4-3: Measurement period for intra-frequency measurements with gaps (Frequency Range FR1)

DRX cycle	$T_{SSB\_measurement\_period\_intra}$
No DRX	max[200ms, 5 x max(MGRP, SMTC period)] x $CSSF_{intra}$
DRX cycle≤ 320ms	max[200ms, ceil(1.5x 5) x max(MGRP, SMTC period,DRX cycle)] x $CSSF_{intra}$
DRX cycle>320ms	5 x max(MGRP, DRX cycle) x $CSSF_{intra}$

[TS 38.133 [6], clause 9.2.2]

The requirements given above apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] sections 10.1.2 are fulfilled for a corresponding Band,
- SS-RSRQ related side conditions given in TS 38.133 [6] sections 10.1.7 are fulfilled for a corresponding Band,
- SS-SINR related side conditions given in TS 38.133 [6] sections 10.1.12 are fulfilled for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

[TS 38.133 [6], clause 9.2.4.2]

The RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.2.1.1 and 10.1.2.1.2, the RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.7.1.1, and the SINR measurement accuracy for all measured cells shall be as specified in the TS 38.133 [6] clause 10.1.12.1.1.

Reported RSRP, RSRQ and SINR measurements contained in event triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1.2.1.1, 10.1.2.1.2, 10.1.7.1.1 and 10.1.12.1.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than Tidentify_intra_with_index defined in TS 38.133 [6] section 9.2.6.2. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2.2, 9.2.4.2, 9.2.6.2 and 9.2.6.3.

6.6.1.1 NR SA FR1 event-triggered reporting without gap in non-DRX

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- Test requirements are between brackets.

6.6.1.1.1 Test purpose

To verify the UE's ability to make a correct reporting of an event within intra-frequency cell search without gap under non-DRX.

6.6.1.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

6.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.1.

6.6.1.1.4 Test description

6.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.1.4.1-1.

Table 6.6.1.1.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting without gap in non-DRX

Test Case ID	Description
6.6.1.1-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.6.1.1-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.6.1.1-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations. Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell.	

Configure the test equirement and the DUT according to the parameters in Table 6.6.1.1.4.1-2.

Table 6.6.1.1.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting without gap in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The test parameters for PCell and neighbour cell are given in Table 6.6.1.1.4.1-3 below.

2. Message contents are defined in clause 6.6.1.1.4.3.

3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.6.1.1.4.1-3: General test parameters for SA intra-frequency event triggered reporting tests without gap for FR1 under non-DRX

Parameter	Unit	Test configuration	Value	Comment
Active cell		1, 2, 3	Cell 1	
Neighbour cell		1, 2, 3	Cell 2	Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 and Cell 2	
SSB configuration		1	SSB.1 FR1	
		2	SSB.1 FR1	
		3	SSB.2 FR1	
SMTC configuration		1	SMTC pattern 2	
		2	SMTC pattern 1	
		3	SMTC pattern 1	
A3-Offset	dB	1, 2, 3	-4.5	
CP length		1, 2, 3	Normal	
Hysteresis	dB	1, 2, 3	0	
Time To Trigger	s	1, 2, 3	0	
Filter coefficient		1, 2, 3	0	L3 filtering is not used
DRX		1, 2, 3		OFF
Time offset between PCell and PSCell		1, 2, 3	3 µs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 µs	Synchronous cells
		3	3 µs	Synchronous cells
T1	s	1, 2, 3	5	
T2	s	1, 2, 3	5	

6.6.1.1.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.1.4.1-3 and Table 6.6.1.1.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.1.5-1. Propagation conditions are set according to Annex C clause C.2.2.T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.1.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than [802] ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set NR Cell 2 physical cell identity = ((current NR cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.6.1.1.4.3-1: Common Exception messages SA intra frequency event triggered reporting tests without gap under non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-3 with Condition SSB.1 FR1, SMTC pattern 2 and Asynchronous cells for configuration 6.6.1.1-1 Table H.3.1-3 with Condition SSB.1 FR1, SMTC pattern 1 and synchronous cells for configuration 6.6.1.1-2 Table H.3.1-3 with Condition SSB.2 FR1, SMTC pattern 1 and synchronous cells for configuration 6.6.1.1-3 Table H.3.1-4 with A3-offset = -4.5dB Table H.3.1-5 Table H.3.1-7

6.6.1.1.5 Test requirement

Table 6.6.1.1.4.1-3 and Table 6.6.1.1.5-1 define the primary level settings including test tolerances for NR SA event triggered reporting test without gap under non-DRX.

Table 6.6.1.1.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting tests without gap under non-DRX

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1	TDDConf.3.1		TDDConf.3.1	
		2	N/A		N/A	
		3	TDDConf.3.1		TDDConf.3.1	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns		1, 2, 3	OP.1		OP.1	
Intial BWP configuration		1, 2, 3	DLBWP.0 ULBWP.0		DLBWP.0 ULBWP.0	
Active DL BWP configuration		1, 2, 3	DLBWP.1		DLBWP.1	
Active UL BWP configuration		1, 2, 3	ULBWP.1		ULBWP.1	
RLM-RS		1, 2, 3	SSB		SSB	
N_{oc} Note 2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} Note 2	dBm/15 KHz	1	-98			
		2				
		3				
$\hat{E}_s/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
		2				
		3				
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/9.36 MHz	1	-64.60	-62.25	-Infinity	-62.25
	dBm/9.36 MHz	2	-64.60	-62.25	-Infinity	-62.25
	dBm/38.16 MHz	3	-58.50	-56.16	-Infinity	-56.16
Propagation Condition		1, 2, 3	AWGN			
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to NR Cell 2.

The overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify\_intra\_without\_index}$

$T_{identify\_intra\_without\_index} = (T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra})$ ms

T_{PSS/SSS_sync_intr}= max [600 ms, ceil ([5] x K_p) x SMTC period] x $CSSF_{intra}$ = 600 ms

$T_{SSB\_measurement\_period\_intra}$= max [200 ms, ceil(5 x K_p) x SMTC period] x $CSSF_{intra}$ = 200 ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of [802] ms in this test case (note: this gives a total of 800 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

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

6.6.1.2 NR SA FR1 event-triggered reporting without gap in DRX

Editor's Note:

- Current parameter of DRX is not correct, needs to be modified by RAN4 in future meetings.

- Message contents are not complete.

- Connection diagram is TBD.

- Test requirements are between brackets.

6.6.1.2.1 Test purpose

To verify the UE's ability to make a correct reporting of an event within intra-frequency cell search without gap under DRX.

6.6.1.2.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

6.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.2.

6.6.1.2.4 Test description

6.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.2.4.1-1.

Table 6.6.1.2.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting without gap in DRX

Test Case ID	Description
6.6.1.2-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.6.1.2-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.6.1.2-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations. Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell.	

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.2.4.1-2.

Table 6.6.1.2.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting without gap in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The test parameters for PCell and neighbour cell are given in Table 6.6.1.2.4.1-3 below.
2. Message contents are defined in clause 6.6.1.2.4.3.
3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.6.1.2.4.1-3: General test parameters for SA intra-frequency event triggered reporting tests without gap for FR1 under DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
Active cell		1, 2, 3	Cell 1		
Neighbour cell		1, 2, 3	Cell 2		Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 and Cell 2		
SSB configuration		1	SSB.1 FR1		
		2	SSB.1 FR1		
		3	SSB.2 FR1		
SMTC configuration		1	SMTC pattern 2		
		2	SMTC pattern 1		
		3	SMTC pattern 1		
A3-Offset	dB	1, 2, 3	-4.5		
CP length		1, 2, 3	Normal		
Hysteresis	dB	1, 2, 3	0		
Time To Trigger	s	1, 2, 3	0		
Filter coefficient		1, 2, 3	0		L3 filtering is not used
DRX	ms	1, 2, 3	40	640	
Time offset between PCell and PSCell		1, 2, 3	3 us		Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 us		Synchronous cells
		2	3 ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		3	3 us		Synchronous cells
T1	s	1, 2, 3	5		
T2	s	1, 2, 3	5	10	

6.6.1.2.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.2.4.1-3 and Table 6.6.1.2.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.2.5-1. Propagation conditions are set according to Annex C clause C.2.2.T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.2.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than [922] ms for Test 1 or less than [6402] ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set NR Cell 2 physical cell identity = ((current NR cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.1.2.4.1-1 as appropriate.

6.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.6.1.2.4.3-1: Common Exception messages for SA intra frequency event triggered reporting tests without gap under DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-3 with Condition SSB.1 FR1, SMTC pattern 2 and Asynchronous cells for configuration 6.6.1.2-1 Table H.3.1-3 with Condition SSB.1 FR1, SMTC pattern 1 and synchronous cells for configuration 6.6.1.2-2 Table H.3.1-3 with Condition SSB.2 FR1, SMTC pattern 1 and synchronous cells for configuration 6.6.1.2-3 Table H.3.1-4 with A3-offset = -4.5dB Table H.3.1-5 Table H.3.1-7 Table H.3.7-1 with Condition DRX.1 for test 1 Table H.3.7-1 with Condition DRX.2 for test 2

6.6.1.2.5 Test requirement

Table 6.6.1.2.4.1-3 , Table 6.6.1.2.5-1, Table 6.6.1.2.5-2 and Table 6.6.1.2.5-3 define the primary level settings including test tolerances for NR event triggered reporting in synchronous cells when DRX is used test.

Table 6.6.1.2.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting tests without gap under DRX

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1	TDDConf.3.1		TDDConf.3.1	
		2	N/A		N/A	
		3	TDDConf.3.1		TDDConf.3.1	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns		1, 2, 3	OP.1		OP.1	
Intial BWP configuration		1, 2, 3	DLBWP.0 ULBWP.0		DLBWP.0 ULBWP.0	
Active DL BWP configuration		1, 2, 3	DLBWP.1		DLBWP.1	
Active UL BWP configuration		1, 2, 3	ULBWP.1		ULBWP.1	
RLM-RS		1, 2, 3	SSB		SSB	
N_{oc} Note 2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} Note 2	dBm/15 KHz	1, 2, 3	-98			
$\hat{E}_s/I_{ot}$	dB	1, 2, 3	4	-1.46	-Infinity	-1.46
$\hat{E}_s/N_{oc}$	dB	1, 2, 3	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/9.36 MHz	1	-64.60	-62.25	-Infinity	-62.25
	dBm/9.36 MHz	2	-64.60	-62.25	-Infinity	-62.25
	dBm/38.16 MHz	3	-58.50	-56.16	-Infinity	-56.16
Propagation Condition		1, 2, 3	AWGN			
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

Table 6.6.1.2.5-2: DRX Configuration for SA intra-frequency event triggered reporting tests without gap under DRX

Field	Test1	Test2	Comment
	Value	Value	
onDurationTimer	psf1	psf1	As specified in clause 6.3.2 in TS 38.331
drx-InactivityTimer	psf1	psf1	
drx-RetransmissionTimer	psf1	psf1	
longDRX-CycleStartOffset	Sf40	Sf640	
shortDRX	disable	disable	

Table 6.6.1.2.5-3: *TimeAlignmentTimer* -Configuration for SA intra-frequency event triggered reporting tests without gap under DRX

Field	Test1	Test2	Comment
	Value	Value	
TimeAlignmentTimer	sf500	sf500	As specified in clause 6.3.2 in TS 38.331

In Test 1 when DRX cycle length = 40 ms, the overall delay measured is defined as the time from the beginning of time period T2 to the moment the UE send one Event A3 triggered measurement report on PUSCH.

In Test 2 when DRX cycle length = 640 ms, the overall delay measured is defined as the time from the beginning of time period T2 to the moment the UE starts to send preambles on the PRACH for Scheduling Request (SR) to obtain allocation to send the measurement report to NR Cell 2 on PUSCH.

For both tests:

The overall delays measured is defined as the time from the beginning of time period T2 to the moment the UE send one Event A3 triggered measurement report to NR Cell 2.

The overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delay measured when DRX cycle length is 40 ms test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify\_intra\_without\_index}$

$T_{identify\_intra\_without\_index} = (T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra})$ ms

T_{PSS/SSS_sync_intra} = max[600ms, ceil(1.5x [5] x K_p) x max(SMTC period,DRX cycle)] x $CSSF_{intra}$= 600ms

$T_{SSB\_measurement\_period\_intra}$ = max[200ms, ceil(1.5x 5 x K_p) x max(SMTC period,DRX cycle)] x $CSSF_{intra}$= 320ms

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 40 ms shall be less than a total of [922] ms.

The overall delay measured when DRX cycle length is 640 ms test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify\_intra\_without\_index}$

$T_{identify\_intra\_without\_index} = (T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra})$ ms

T_{PSS/SSS_sync_intra} = ceil([5] x K_p) x DRX cycle x $CSSF_{intra}$ = 3200ms

$T_{SSB\_measurement\_period\_intra}$ = ceil(5 x K_p) x DRX cycle x $CSSF_{intra}$ = 3200ms

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 640 ms shall be less than a total of [6402] ms.

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

6.6.1.3 NR SA FR1 event-triggered reporting with gap in non-DRX

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- Test requirements are between brackets.

6.6.1.3.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event with gaps under non-DRX within intra-frequency cell search with gaps requirements.

6.6.1.3.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

6.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.3.

6.6.1.3.4 Test description

6.6.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.3.4.1-1.

Table 6.6.1.3.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting with gap in non-DRX

Test Case ID	Description
6.6.1.3-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.6.1.3-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.6.1.3-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.3.4.1-2.

Table 6.6.1.3.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting with gap in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	

Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 6.6.1.3.4.1-3.
2. Message contents are defined in clause 6.6.1.3.4.3.
3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.6.1.3.4.1-3: General test parameters for NR SA FR1 event-triggered reporting with gap in non-DRX

Parameter	Unit	Test configuration	Value	Comment
Active cell		1, 2, 3	Cell 1	
Neighbour cell		1, 2, 3	Cell 2	Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 and Cell 2	
Measurement gap type		1, 2, 3	Per-UE gaps	
Measurement gap repitition periodicity	ms	1, 2, 3	40	
Measurement gap length	ms	1, 2, 3	6	
Measurement gap offset	ms	1, 2, 3	39	
SSB configuration		1	SSB.1 FR1	
		2	SSB.1 FR1	
		3	SSB.2 FR1	
SMTC configuration		1	SMTC pattern 2	
		2	SMTC pattern 1	
		3	SMTC pattern 1	
CSI-RS parameters		1	TBD	
		2	TBD	
		3	TBD	
A3-Offset	dB	1, 2, 3	-4.5	
CP length		1, 2, 3	Normal	
Hysteresis	dB	1, 2, 3	0	
Time To Trigger	s	1, 2, 3	0	
Filter coefficient		1, 2, 3	0	L3 filtering is not used
DRX	ms	1, 2, 3		OFF
Time offset between PCell and PSCell		1, 2, 3	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 μs	Synchronous cells
		3	3 μs	Synchronous cells
T1	s	1, 2, 3	5	
T2	s	1, 2, 3	5	

6.6.1.3.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.3.4.1-3 and Table 6.6.1.3.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.3.5-1. Propagation conditions are set according to Annex C clauses C.2.2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.3.5-1.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than [802] ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6) or when T2 expires, the SS shall transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.6.1.3.4.3-1: Common Exception messages for NR SA FR1 event-triggered reporting with gap in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition GAP NEEDED Table H.3.1-3 with Condition SSB.1 FR1, SMTC pattern 2 and Asynchronous cells for Configuration 6.6.1.3-1 Table H.3.1-3 with Condition SSB.1 FR1, SMTC pattern 1 and Synchronous cells for Configuration 6.6.1.3-2 Table H.3.1-3 with Condition SSB.2 FR1, SMTC pattern 1 and Synchronous cells for Configuration 6.6.1.3-3 Table H.3.1-4 with A3-offset = -4.5dB Table H.3.1-5 Table H.3.1-6 with Condition Pattern #0 Table H.3.1-7

6.6.1.3.5 Test requirement

Table 6.6.1.3.4.1-3 and Table 6.6.1.3.5-1 define the primary level settings including test tolerances for NR SA FR1 event-triggered reporting with gap in non-DRX test.

Table 6.6.1.3.5-1: NR Cell specific test parameters for NR SA FR1 event-triggered reporting with gap in non-DRX

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1	TDDConf.3.1		TDDConf.3.1	
		2	N/A		N/A	
		3	TDDConf.3.1		TDDConf.3.1	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns		1, 2, 3	OP.1		OP.1	
Intial BWP configuration		1, 2, 3	DLBWP.0 ULBWP.0		DLBWP.0 ULBWP.0	
Active DL BWP configuration		1, 2, 3	DLBWP.2		DLBWP.1	
Active UL BWP configuration		1, 2, 3	ULBWP.1		ULBWP.1	
RLM-RS		1, 2, 3	CSI-RS		SSB	
N_{oc} Note 2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} Note 2	dBm/15 KHz	1	-98			
		2				
		3				
$\hat{E}_s/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
		2				
		3				
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/9.36 MHz	1	-64.60	-62.25	-Infinity	-62.25
	dBm/9.36 MHz	2	-64.60	-62.25	-Infinity	-62.25
	dBm/38.16 MHz	3	-58.50	-56.16	-Infinity	-56.16
Propagation Condition		1, 2, 3	AWGN			
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify\_intra\_without\_index}$

$T_{identify\_intra\_without\_index} = T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra}$

T_{PSS/SSS_sync_intra} = [600] ms

$T_{SSB\_measurement\_period\_intra}$ = [200] ms

TTI insertion uncertainty = [2] ms

The overall delays measured shall be less than a total of [802] ms in this test case (note: this gives a total of [800] ms for measurement reporting delay plus [2] ms for TTI insertion uncertainty).

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

6.6.1.4 NR SA FR1 event-triggered reporting with gap in DRX

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- Test requirements are between brackets.- Current parameter of DRX is not correct, needs to be modified by RAN4 in future meetings.

6.6.1.4.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event with gaps under DRX within intra-frequency cell search with gaps requirements.

6.6.1.4.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

6.6.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.4.

6.6.1.4.4 Test description

6.6.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.4.4.1-1.

Table 6.6.1.4.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting with gap in DRX

Test Case ID	Description
6.6.1.4-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.6.1.4-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.6.1.4-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.4.4.1-2.

Table 6.6.1.4.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting with gap in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.6.1.4.4.1-3.
2. Message contents are defined in clause 6.6.1.4.4.3.
3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.6.1.4.4.1-3: General test parameters for NR SA FR1 event-triggered reporting with gap in DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
Active cell		1, 2, 3	Cell 1		
Neighbour cell		1, 2, 3	Cell 2		Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 and Cell 2		
Measurement gap type		1, 2, 3	Per-UE gaps		
Measurement gap repitition periodicity	ms	1, 2, 3	40		
Measurement gap length	ms	1, 2, 3	6		
Measurement gap offset	ms	1, 2, 3	39		
SSB configuration		1	SSB.1 FR1		
		2	SSB.1 FR1		
		3	SSB.2 FR1		
SMTC configuration		1	SMTC pattern 2		
		2	SMTC pattern 1		
		3	SMTC pattern 1		
CSI-RS parameters		1	TBD		
		2	TBD		
		3	TBD		
A3-Offset	dB	1, 2, 3	-4.5		
CP length		1, 2, 3	Normal		
Hysteresis	dB	1, 2, 3	0		
Time To Trigger	s	1, 2, 3	0		
Filter coefficient		1, 2, 3	0		L3 filtering is not used
DRX	ms	1, 2, 3	40	640	
Time offset between PCell and PSCell		1, 2, 3	3 μs		Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 μs		Synchronous cells
		3	3 μs		Synchronous cells
T1	s	1, 2, 3	5		
T2	s	1, 2, 3	5	10	

6.6.1.4.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.4.4.1-3 and Table 6.6.1.4.4.2-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In Test 1 when DRX cycle = 40 ms is used, UE needs to be provided at least once every 500 ms with new Timing Advance Command MAC control element to restart the Timer Alignment Timer to keep the UE uplink time alignment. Furthermore, the UE is allocated with PUSCH resource at every DRX cycle. In Test 2 when DRX = 640 ms is used, the uplink time alignment is not maintained and the UE needs to use RACH to obtain uplink allocation for measurement reporting.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.4.5-1. Propagation conditions are set according to Annex C clauses C.2.2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.4.5-1.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than [922] ms for Test 1 or less than [6402] ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.1.4.4.1-3 as appropriate.

6.6.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.6.1.4.4.3-1: Common Exception messages for NR SA FR1 event-triggered reporting with gap in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition GAP NEEDED Table H.3.1-3 with Condition SSB.1 FR1, SMTC pattern 2 and Asynchronous cells for configuration 1 Table H.3.1-3 with Condition SSB.1 FR1, SMTC pattern 2 and Asynchronous cells for configuration 2 Table H.3.1-3 with Condition SSB.1 FR1, SMTC pattern 2 and Asynchronous cells for configuration 3 Table H.3.1-4 with A3-offset = -4.5dB Table H.3.1-5 Table H.3.1-6 with Condition Pattern #0 Table H.3.1-7 Table H.3.7-1 with Condition DRX.1 for test 1 Table H.3.7-1 with Condition DRX.1 for test 2

6.6.1.4.5 Test requirement

Table 6.6.1.4.4.1-3, Table 6.6.1.4.5-1, Table 6.6.1.4.5-2 and Table 6.6.1.4.5-3 define the primary level settings including test tolerances for NR SA FR1 event-triggered reporting with gap in DRX test.

Table 6.6.1.4.5-1: NR Cell specific test parameters for NR SA FR1 event-triggered reporting with gap in DRX

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1	TDDConf.3.1		TDDConf.3.1	
		2	N/A		N/A	
		3	TDDConf.3.1		TDDConf.3.1	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns		1, 2, 3	OP.1		OP.1	
Intial BWP configuration		1, 2, 3	DLBWP.0 ULBWP.0		DLBWP.0 ULBWP.0	
Active DL BWP configuration		1, 2, 3	DLBWP.2		DLBWP.1	
Active UL BWP configuration		1, 2, 3	ULBWP.1		ULBWP.1	
RLM-RS		1, 2, 3	CSI-RS		SSB	
N_{oc} Note 2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} Note 2	dBm/15 KHz	1	-98			
		2				
		3				
$\hat{E}_s/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
		2				
		3				
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/9.36 MHz	1	-64.60	-62.25	-Infinity	-62.25
	dBm/9.36 MHz	2	-64.60	-62.25	-Infinity	-62.25
	dBm/38.16 MHz	3	-58.50	-56.16	-Infinity	-56.16
Propagation Condition		1, 2, 3	AWGN			
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

Table 6.6.1.4.5-2: DRX-Configuration for NR SA FR1 event-triggered reporting with gap in DRX

Field	Test1	Test2	Comment
	Value	Value	
onDurationTimer	psf1	psf1	As specified in clause 6.3.2 in TS 38.331
drx-InactivityTimer	psf1	psf1	
drx-RetransmissionTimer	psf1	psf1	
longDRX-CycleStartOffset	Sf40	Sf640	
shortDRX	disable	disable	

Table 6.6.1.4.5-3: *TimeAlignmentTimer* -Configuration for NR SA FR1 event-triggered reporting with gap in DRX

Field	Test1	Test2	Comment
	Value	Value	
TimeAlignmentTimer	sf500	sf500	As specified in clause 6.3.2 in TS 38.331

In Test 1 when DRX cycle length = 40 ms is used, the overall delay measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report on PUSCH.

In Test 2 when DRX cycle length = 640 ms is used, the overall delay measured is defined as the time from the beginning of time period T2, to the moment the UE starts to send preambles on the PRACH for Scheduling Request (SR) to obtain allocation to send the measurement report on PUSCH.

For both tests:

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

NOTE 1: The actual overall delays measured in the test may be up to one DRX cycle higher than the measurement reporting delays above because UE is allowed to delay the initiation of the measurement reporting procedure to the next until the Active Time.

NOTE 2: In order to calculate the rate of correct events the system simulator shall verify that it has received correct Event A3 measurement report.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify\_intra\_without\_index}$

$T_{identify\_intra\_without\_index} = T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra}$

T_{PSS/SSS_sync_intra} = [600] ms for Test 1, and T_{PSS/SSS_sync_intra} =[3200] ms for Test 2

$T_{SSB\_measurement\_period\_intra}$ = [320] ms for Test 1, and $T_{SSB\_measurement\_period\_intra}$ = [3200] ms for Test 2

TTI insertion uncertainty = [2] ms

For Test 1, the overall delays measured shall be less than a total of [922] ms (note: this gives a total of [920] ms for measurement reporting delay plus [2] ms for TTI insertion uncertainty).

For Test 2, the overall delays measured shall be less than a total of [6402] ms (note: this gives a total of [6400] ms for measurement reporting delay plus [2] ms for TTI insertion uncertainty).

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

6.6.1.5 NR SA FR1 event-triggered reporting without gap in non-DRX with SSB index reading

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- Test requirements are between brackets.

6.6.1.5.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event within intra-frequency cell search without gaps requirements.6.6.1.5.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

6.6.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.5.

6.6.1.5.4 Test description

6.6.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.5.4.1-1.

Table 6.6.1.5.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting without gap in non-DRX with SSB index reading

Configuration	Description
6.6.1.5-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.5.4.1-2.

Table 6.6.1.5.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting without gap in non-DRX with SSB index reading

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.6.1.5.4.1-3.

2. Message contents are defined in clause 6.6.1.5.4.3.

3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.6.1.5.4.1-3: General test parameters for NR SA FR1 event-triggered reporting without gap in non-DRX with SSB index reading

Parameter	Unit	Test configuration	Value	Comment
Active cell		1	Cell 1	
Neighbour cell		1	Cell 2	Cell to be identified.
RF Channel Number		1	1: Cell 1 and Cell 2	
SSB configuration		1	SSB.1 FR1	
SMTC configuration		1	SMTC pattern 2	
A3-Offset	dB	1	-4.5	
CP length		1	Normal	
Hysteresis	dB	1	0	
Time To Trigger	s	1	0	
Filter coefficient		1	0	L3 filtering is not used
DRX	ms	1		OFF
Time offset between PCell and PSCell		1	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
T1	s	1	5	
T2	s	1	5	

6.6.1.5.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.5.4.1-3 and Table 6.6.1.5.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.5.5-1. Propagation conditions are set according to Annex C clauses C.2.2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.5.5-1.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than [922] ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),

or

- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 clause 4.6 with the following exceptions:

Table 6.6.1.5.4.3-1: Common Exception messages for NR SA FR1 event-triggered reporting without gap in non-DRX with SSB index reading

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-3 with Condition SSB.1 FR1, SMTC pattern 2 and Asynchronous cells for Configuration 6.6.1.5-1 Table H.3.1-4 with A3-offset = -4.5 dB Table H.3.1-5 Table H.3.1-7

6.6.1.5.5 Test requirement

Table 6.6.1.5.4.1-3 and Table 6.6.1.5.5-1 define the primary level settings including test tolerances for SA event triggered reporting without gap under non-DRX with SSB index reading test.

Table 6.6.1.5.5-1: NR Cell specific test parameters for NR SA FR1 event-triggered reporting without gap in non-DRX with SSB index reading

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1	N/A		N/A	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
OCNG Patterns		1	OP.1		OP.1	
Intial BWP configuration		1	DLBWP.0 ULBWP.0		DLBWP.0 ULBWP.0	
Active DL BWP configuration		1	DLBWP.1		DLBWP.1	
Active UL BWP configuration		1	ULBWP.1		ULBWP.1	
RLM-RS		1	SSB		SSB	
N_{oc} Note 2	dBm/SCS	1	-98			
N_{oc} Note 2	dBm/15 KHz	1	-98			
$\hat{E}_s/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
Io	dBm/9.36 MHz	1	-64.60	-62.25	-Infinity	-62.25
Propagation Condition		1	AWGN			
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify\_intra\_with\_index}$

$T_{identify\_intra\_with\_index} = T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra} + T_{SSB\_time\_index\_intra}$

T_{PSS/SSS_sync_intra} = [600] ms

$T_{SSB\_time\_index\_intra}$ = [120] ms

$T_{SSB\_measurement\_period\_intra}$ = [200] ms

TTI insertion uncertainty = [2] ms

The overall delays measured shall be less than a total of [922] ms in this test case (note: this gives a total of [920] ms for measurement reporting delay plus [2] ms for TTI insertion uncertainty).

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

6.6.1.6 NR SA FR1 event-triggered reporting with gap in non-DRX with SSB index reading

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- Test requirements are between brackets.

6.6.1.6.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event within intra-frequency cell search with gaps requirements.

6.6.1.6.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

6.6.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.6.

6.6.1.6.4 Test description

6.6.1.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.6.4.1-1.

Table 6.6.1.6.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting with gap in non-DRX with SSB index reading

Configuration	Description
6.6.1.6-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.3.4.1-2.

Table 6.6.1.6.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting with gap in non-DRX with SSB index reading

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.6.1.6.4.1-3.

2. Message contents are defined in clause 6.6.1.6.4.3.

3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.6.1.6.4.1-3: General test parameters for NR SA FR1 event-triggered reporting with gap in non-DRX with SSB index reading

Parameter	Unit	Test configuration	Value	Comment
Active cell		1	Cell 1	
Neighbour cell		1	Cell 2	Cell to be identified.
RF Channel Number		1	1: Cell 1 and Cell 2	
Measurement gap type		1	Per-UE gaps	
Measurement gap repitition periodicity	ms	1	40	
Measurement gap length	ms	1	6	
Measurement gap offset	ms	1	39	
SSB configuration		1	SSB.1 FR1	
SMTC configuration		1	SMTC pattern 2	
CSI-RS parameters		1	TBD	
A3-Offset	dB	1	-4.5	
CP length		1	Normal	
Hysteresis	dB	1	0	
Time To Trigger	s	1	0	
Filter coefficient		1	0	L3 filtering is not used
DRX	ms	1		OFF
Time offset between PCell and PSCell		1	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
T1	s	1	5	
T2	s	1	5	

6.6.1.6.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.6.4.1-3 and Table 6.6.1.6.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.6.5-1. Propagation conditions are set according to Annex C clauses C.2.2. T1 starts.

3. SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.3.5-1.

6. UE shall transmit a MeasurementReport message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than [922] ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6) or when T2 expires, the SS shall transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 clause 4.6 with the following exceptions:

Table 6.6.1.6.4.3-1: Common Exception messages for NR SA FR1 event-triggered reporting with gap in non-DRX with SSB index reading

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition GAP NEEDED Table H.3.1-3 with Condition SSB.1 FR1, SMTC pattern 2 and Asynchronous cells for Configuration 6.6.1.6-1 Table H.3.1-4 with A3-offset = -4.5dB Table H.3.1-5 Table H.3.1-6 with Condition Pattern #0 Table H.3.1-7

6.6.1.6.5 Test requirement

Table 6.6.1.6.4.1-3 and Table 6.6.1.6.5-1 define the primary level settings including test tolerances for SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading test.

Table 6.6.1.6.5-1: NR Cell specific test parameters for NR SA FR1 event-triggered reporting with gap in non-DRX with SSB index reading

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1	N/A		N/A	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
OCNG Patterns		1	OP.1		OP.1	
Intial BWP configuration		1	DLBWP.0 ULBWP.0		DLBWP.0 ULBWP.0	
Active DL BWP configuration		1	DLBWP.2		DLBWP.1	
Active UL BWP configuration		1	ULBWP.1		ULBWP.1	
RLM-RS		1	CSI-RS		SSB	
N_{oc} Note 2	dBm/SCS	1	-98			
N_{oc} Note 2	dBm/15 KHz	1	-98			
$\hat{E}_s/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
Io	dBm/9.36 MHz	1	-64.60	-62.25	-Infinity	-62.25
Propagation Condition		1	AWGN			
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report.

The overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify\_intra\_with\_index}$

$T_{identify\_intra\_with\_index} = T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra} + T_{SSB\_time\_index\_intra}$

T_{PSS/SSS_sync_intra} = [600] ms

$T_{SSB\_time\_index\_intra}$ = [120] ms

$T_{SSB\_measurement\_period\_intra}$ = [200] ms

TTI insertion uncertainty = [2] ms

The overall delays measured shall be less than a total of [922] ms in this test case (note: this gives a total of [920] ms for measurement reporting delay plus [2] ms for TTI insertion uncertainty).

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

6.6.2 Inter-frequency measurements

6.6.2.0 Minimum conformance requirements for Inter-frequency measurements

[TS 38.133, clause 9.3.2]

The requirements in Section 9.3 apply, provided:

- The cell being identified or measured is detectable.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in Sections 10.1.4 and 10.1.5 for FR1 and FR2, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in Sections 10.1.9 and 10.1.10 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in Sections 10.1.14 and 10.1.15 for FR1 and FR2, respectively, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to Annex B.2.3 for a corresponding Band.

[TS 38.133, clause 9.3.4]

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter frequency cell within $T_{identify\_inter\_without\_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within $T_{identify\_inter\_with\_index}$. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within $T_{identify\_inter\_without\_index}$.

$$T_{identify\_inter\_without\_index} = (T_{PSS/SSS\_sync\_inter} + T_{SSB\_measurement\_period\_inter})\ ms$$

$$T_{identify\_inter\_with\_index} = (T_{PSS/SSS\_sync\_inter} + T_{SSB\_measurement\_period\_inter} + T_{SSB\_time\_index\_inter})\ ms$$

Where:

T_{PSS/SSS_sync_inter}: it is the time period used in PSS/SSS detection given in table 9.3.4-1.

$T_{SSB\_time\_index\_inter}$: it is the time period used to acquire the index of the SSB being measured given in table 9.3.4-3.

$T_{SSB\_measurement\_period\_inter}$: equal to a measurement period of SSB based measurement given in table 9.3.5-1.

$M_{SSB\_index\_inter}$: For a UE supporting power class 1, $M_{SSB\_index\_inter}$ =[40] samples. For a vehicle mounted UE supporting power class 2 (vehicle mounted), M_{pss/sss_sync_inter}=[24] samples.For a UE supporting power class 3 (handheld), $M_{SSB\_index\_inter}$ =[24] samples. For a UE supporting power class 4, $M_{meas\_period\_inter}$ =[TBD] samples.

$M_{meas\_period\_inter}$: For a UE supporting FR2 power class 1, $M_{meas\_period\_inter}$ =64 samples. For a vehicle mounted UE supporting FR2 power class 2 (vehicle mounted), M_{pss/sss_sync_inter}=40 samples.For a UE supporting FR2 power class 3 (handheld), $M_{meas\_period\_inter}$ =40 samples. For a UE supporting FR2 power class 4, $M_{meas\_period\_inter}$ =[40] samples.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within\_gap,i}$ in section 9.1.5.2 for measurement conducted within measurement gaps.

Table 9.3.4-1: Time period for PSS/SSS detection, (Frequency range FR1)

Condition NOTE1,2	T_{PSS/SSS_sync_inter}
No DRX	max[600ms, [8] x max(MGRP, SMTC period)] x $CSSF_{inter}$
DRX cycle ≤ 320ms	max[600ms, ceil(8x1.5) x max(MGRP, SMTC period, DRX cycle)] x $CSSF_{inter}$
DRX cycle > 320ms	[8] x DRX cycle x $CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

Table 9.3.4-3: Time period for time index detection (Frequency range FR1)

Condition NOTE1,2	$T_{SSB\_time\_index\_inter}$
No DRX	max[120ms, [3] x max(MGRP, SMTC period)] x $CSSF_{inter}$
DRX cycle ≤ 320ms	max[120ms, ceil(3 x 1.5) x max(MGRP, SMTC period, DRX cycle)] x $CSSF_{inter}$
DRX cycle > 320ms	[3] x DRX cycle x $CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

[TS 38.133, clause 9.3.5]

When measurement gaps are provided for inter frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in sub-clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 9.3.5-1 and 9.3.5-2:

Table 9.3.5-1: Measurement period for inter-frequency measurements with gaps (Frequency FR1)

Condition NOTE1,2	$T_{SSB\_measurement\_period\_inter}$
No DRX	max[200ms, [8] x max(MGRP, SMTC period)] x $CSSF_{inter}$
DRX cycle ≤ 320ms	max[200ms, ceil(8 x 1.5) x max(MGRP, SMTC period, DRX cycle)] x $CSSF_{inter}$
DRX cycle > 320ms	[8] x DRX cycle x $CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

[TS 38.133, clause 9.3.6.3]

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered measurement reports shall meet the requirements in sections 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be within $T_{identify\_inter\_without\_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index. Otherwise UE shall be able to identify a new detectable inter frequency cell within $T_{identify\_inter\_with\_index}$. Both $T_{identify\_inter\_without\_index}$ and $T_{identify\_inter\_with\_index}$ are defined in clause 9.3.4. When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{identify\_inter\_without\_index}$ or $T_{identify\_inter\_with\_index}$ defined in clause 9.3.4 and then triggers the measurement report as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than $T_{SSB\_measurement\_period\_inter}$ defined in clause 9.3.5 provided the timing to that cell has not changed more than ± 3200 Tc while measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clause 9.3.2, 9.3.4, 9.3.5, 9.3.6.3.

6.6.2.1 NR SA FR1-FR1 event-triggered reporting in non-DRX

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.
- Antenna diagram for TE Part for 4Rx capable UEs without any 2Rx RF bands is TBD
- Message content contain [ ] and TBDs
- Minimum conformance requirements contain [ ] and TBDs (RAN4 pending)
- Test requirement contains TBDs (RAN4 pending)
- Initial conditions contain TBDs (RAN4 pending)
- T1 and T2 values are pending (RAN4 pending)

6.6.2.1.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within inter-frequency NR cell search requirements without SSB time index detection in TS 38.133 [6] clause 9.3.4.

6.6.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.1.

6.6.2.1.4 Test description

6.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.2.1.4.1-2. Test environment parameters are given in Table 6.6.2.1.4.1-3.

Table 6.6.2.1.4.1-1: SA FR1-FR1 event triggered reporting tests in non-DRX supported test configurations

Test Case ID	Description
6.6.2.1-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.6.2.1-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.6.2.1-3	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 6.6.2.1.4.1-2: SA FR1-FR1 general test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection in non DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
NR RF Channel Number		Config 1,2,3	1, 2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cell2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0	4	As specified in TS 38.133 clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39	19	
SMTC-SSB parameters		Config 1	SSB.1 FR1		As specified in TS 38.133 clause A.3.10.1
		Config 2	SSB.1 FR1		As specified in TS 38.133 clause A.3.10.1
		Config 3	SSB.2 FR1		As specified in TS 38.133 clause A.3.10.1
A3-Offset	dB	Config 1,2,3	-6		
Hysteresis	dB	Config 1,2,3	0		
CP length		Config 1,2,3	Normal		
TimeToTrigger	s	Config 1,2,3	0		
Filter coefficient		Config 1,2,3	0		L3 filtering is not used
DRX		Config 1,2,3	OFF		DRX is not used
Time offset between serving and neighbour cells		Config 1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3µs		Synchronous cells.
T1	s	Config 1,2,3	5		
T2	s	Config 1,2,3	TBD	TBD	

Table 6.6.2.1.4-3: Test Environment parameters for SA inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.x.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.x	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and TBD for TE part.		

1. Message contents are defined in clause 6.6.2.1.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

6.6.2.1.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 6.6.2.1.4-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table 6.6.2.1.4-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.1.4-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.1.4-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.2.1.4-2 as appropriate.

6.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.6.2.1.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED Table H.3.1-3 with Condition SSB.1 FR1, SMTC pattern 2 and Asynchronous cells for configuration 6.6.2.1-1 Table H.3.1-3 with Condition SSB.1 FR1, SMTC pattern 1 and synchronous cells for configuration 6.6.2.1-2 Table H.3.1-3 with Condition SSB.2 FR1, SMTC pattern 1 and synchronous cells for configuration 6.6.2.1-3 Table H.3.1-4 with A3-offset = -6dB Table H.3.1-5 Table H.3.1-6 with Condition Pattern #0 for Test 1 Table H.3.1-6 with Condition Pattern #4 for Test 2 Table H.3.1-7

6.6.2.1.5 Test requirement

Table 6.6.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.6.2.1.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection in non-DRX

Parameter		Unit	Test configuration	Cell 1 T1	Cell 1 T2	Cell 2 T1	Cell 2 T2
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD			
			Config 2,3	TDD			
TDD configuration			Config 1	Not Applicable			
			Config 2	TDDConf.1.1			
			Config 3	TDDConf.2.1			
$BW_{channel}$		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP BW		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP configuration	Initial DL BWP		Config 1, 2, 3	DLBWP.0.1			
	Dedicated DL BWP			DLBWP.1.1			
	Dedicated UL BWP			ULBWP.1.1			
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD		-	
			Config 2	SR.1.1 TDD			
			Config 3	SR2.1 TDD			
CORESET Reference Channel			Config 1	CR.1.1 FDD		-	
			Config 2	CR.1.1 TDD			
			Config 3	CR2.1 TDD			
SMTC configuration defined in A.3.11.1 and A.3.11. 2			Config 1	SMTC.2			
			Config 2, 3	SMTC.1			
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15			
			Config 3	30			
EPRE ratio of PSS to SSS			Config 1,2,3	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
N_{oc} Note2		dBm/15 kHz		-98+TT			
N_{oc} Note2		dBm/SCS	Config 1,2	-98+TT			
			Config 3	-95+TT			
SS-RSRP Note 3		dBm/SCS	Config 1,2	-94+TT	-94+TT	-Infinity	-91+TT
			Config 3	-91+TT	-91+TT	-Infinity	-88+TT
$\hat{E}_s/I_{ot}$		dB	Config 1,2,3,4,5,6	4+TT	4+TT	-Infinity	7+TT
$\hat{E}_s/N_{oc}$		dB	Config 1,2,3	4+TT	4+TT	-Infinity	7+TT
Io Note3		dBm/9.36MHz	Config 1,2	-67.11+TT	-67.11+TT	-Infinity	-65.38+TT

	dBm/38.16MHz	Config 3	-62.27+TT	-62.27+TT	-Infinity	-61.06+TT
Propagation Condition		Config 1,2,3	AWGN			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.						

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.2.2 NR SA FR1-FR1 event-triggered reporting in DRX

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.
- Antenna diagram for TE Part for 4Rx capable UEs without any 2Rx RF bands is TBD
- Message content contain [ ] and TBDs
- Minimum conformance requirements contain [ ] and TBDs (RAN4 pending)
- Test requirement contains TBDs (RAN4 pending)
- Initial conditions contain TBDs (RAN4 pending)

6.6.2.2.1 Test purpose

To verify that the UE makes correct reporting of an event in DRX within inter-frequency NR cell search requirements without SSB time index detection in TS 38.133 [6] clause 9.3.4.

6.6.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.2.

6.6.2.2.4 Test description

6.6.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.2.2.4.1-2. Test environment parameters are given in Table 6.6.2.2.4.1-3.

Table 6.6.2.2.4.1-1: SA FR1-FR1 event triggered reporting tests in DRX supported test configurations

Test Case ID	Description
6.6.2.2-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.6.2.2-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.6.2.2-3	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 6.6.2.2.4-2: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
NR RF Channel Number		Config 1,2,3	1, 2				Two FR1 NR carrier frequencies is used
Active cell		Config 1,2,3	NR cell 1 (Pcell)				NR Cell 1 is on NR RF channel number 1
Neighbour cell		Config 1,2,3	NR cell2				NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0		2		As specified in TS 38.133 clause 9.1.2-1
Measurement gap offset		Config 1,2,3	39		39		
SMTC-SSB parameters		Config 1	SSB.1 FR1				As specified in TS 38.133 clause A.3.10.1
		Config 2	SSB.1 FR1				As specified in TS 38.133 clause A.3.10.1
		Config 3	SSB.2 FR1				As specified in TS 38.133 clause A.3.10.1
A3-Offset	dB	Config 1,2,3	-6				
Hysteresis	dB	Config 1,2,3	0				
CP length		Config 1,2,3	Normal				
TimeToTrigger	s	Config 1,2,3	0				
Filter coefficient		Config 1,2,3	0				L3 filtering is not used
DRX		Config 1,2,3	DRX.1	DRX.2	DRX.1	DRX.2	DRX is used
Time offset between serving and neighbour cells		Config 1	3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs				Synchronous cells
T1	s	Config 1,2,3	5				
T2	s	Config 1,2,3	TBD	TBD	TBD	TBD	

Table 6.6.2.2.4-3: Test Environment parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection in DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.

<table>
<tr><td>Test frequencies</td><td colspan="3">As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.</td></tr>
<tr><td>Channel bandwidth</td><td colspan="3">As specified by the test configuration selected from Table 4.6.2.1.4.1-1.</td></tr>
<tr><td>Propagation conditions</td><td colspan="2">AWGN</td><td>As specified in Annex C.2.2.</td></tr>
<tr><td rowspan="2">Connection Diagram</td><td>TE Part</td><td>A.3.1.x.2</td><td rowspan="2">As specified in TS 38.508-1 [14] Annex A.</td></tr>
<tr><td>DUT Part</td><td>A.3.2.3.x</td></tr>
<tr><td>Exceptions to connection diagram</td><td colspan="2">- Without LTE link
- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and TBD for TE part.</td><td></td></tr>
</table>

1. Message contents are defined in clause 6.6.2.2.4.3.
2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

6.6.2.2.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 6.6.2.2.4-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table 6.6.2.2.4-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 6.6.2.2.4-2. T1 starts.
3. The SS shall transmit an *RRCReconfiguration* message.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.2.4-2.
6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than TBD for Test 1, TBD for Test 2, TBD for Test 3 and TBD for Test 4 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.
7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]
9. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
or:
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.2.2.4-2 as appropriate.

6.6.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.6.2.2.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED Table H.3.1-3 with Condition SSB.1 FR1, SMTC pattern 2 and Asynchronous cells for configuration 6.6.2.1-1 Table H.3.1-3 with Condition SSB.1 FR1, SMTC pattern 1 and synchronous cells for configuration 6.6.2.1-2 Table H.3.1-3 with Condition SSB.2 FR1, SMTC pattern 1 and synchronous cells for configuration 6.6.2.1-3 Table H.3.1-4 with A3-offset = -6dB Table H.3.1-5 Table H.3.1-6 with Condition Pattern #0 for Test 1 Table H.3.1-6 with Condition Pattern #4 for Test 2 Table H.3.1-7 Table H.3.7-1 with Condition DRX.1 for Test 1 and Test 3 Table H.3.7-1 with Condition DRX.2 for Test 2 and Test 4

6.6.2.2.5 Test requirement

Table 6.6.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.6.2.2.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD			
			Config 2,3	TDD			
TDD configuration			Config 1	Not Applicable			
			Config 2	TDDConf.1.1			
			Config 3	TDDConf.2.1			
$BW_{channel}$		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP BW		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP configuration	Initial DL BWP		Config 1, 2, 3	DLBWP.0.1			
	Dedicated DL BWP			DLBWP.1.1			
	Dedicated UL BWP			ULBWP.1.1			
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD		-	
			Config 2	SR.1.1 TDD			
			Config 3	SR2.1 TDD			
CORESET Reference Channel			Config 1	CR.1.1 FDD		-	
			Config 2	CR.1.1 TDD			
			Config 3	CR2.1 TDD			
SMTC configuration defined in A.3.11.1 and A.3.11. 2			Config 1	SMTC.2			
			Config 2, 3	SMTC.1			
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15			
			Config 3	30			
EPRE ratio of PSS to SSS			Config 1,2,3	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
N_{oc} Note2		dBm/15 kHz	Config 1,2,3	-98+TT			
N_{oc} Note2		dBm/SCS	Config 1,2	-98+TT			
			Config 3	-95+TT			
SS-RSRP Note 3		dBm/SCS	Config 1,2	-94+TT	-94+TT	-Infinity	-91+TT
			Config 3	-91+TT	-91+TT	-Infinity	-88+TT
$\hat{E}_s/I_{ot}$		dB	Config 1,2,3,4,5,6	4+TT	4+TT	-Infinity	7+TT
$\hat{E}_s/N_{oc}$		dB	Config 1,2,3	4+TT	4+TT	-Infinity	7+TT
Io Note3		dBm/9.36MHz	Config 1,2	-67.11+TT	-67.11+TT	-Infinity	-65.38+TT

	dBm/38.16MHz	Config 3	-62.27+TT	-62.27+TT	-Infinity	-61.06+TT
Propagation Condition		Config 1,2,3	AWGN			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.						

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2 , 3 and 4 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.2.3 NR SA FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.
- Antenna diagram for TE Part for 4Rx capable UEs without any 2Rx RF bands is TBD
- Message content contain TBDs
- Minimum conformance requirements contain [ ] and TBDs (RAN4 pending)
- Test requirement contains TBDs (RAN4 pending)
- Initial conditions contain TBDs (RAN4 pending)

6.6.2.3.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within inter-frequency NR cell search requirements with SSB time index detection in TS 38.133 [6] clause 9.3.4.

6.6.2.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.6.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.3.

6.6.2.3.4 Test description

6.6.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.3.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.2.3.4.1-2. Test environment parameters are given in Table 6.6.2.3.4.1-3.

Table 6.6.2.3.4.1-1: SA FR1-FR1 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations

Test Case ID	Description
6.6.2.3-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.6.2.3-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.6.2.3-3	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 6.6.2.3.4-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
NR RF Channel Number		Config 1,2,3	1, 2		Two FR1 NR carrier frequencies is used
Active cell		Config 1,2,3	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1
Neighbour cell		Config 1,2,3	NR cell2		NR cell 2 is on NR RF channel number 2
Gap Pattern Id		Config 1,2,3	0	2	As specified in TS 38.133 clause 9.1.2-1
Measurement gap offset		Config 1,2,3	39	39	
SMTC-SSB parameters		Config 1	SSB.1 FR1		As specified in TS 38.133 clause A.3.10.1
		Config 2	SSB.1 FR1		As specified in TS 38.133 clause A.3.10.1
		Config 3	SSB.2 FR1		As specified in TS 38.133 clause A.3.10.1
A3-Offset	dB	Config 1,2,3	-6		
Hysteresis	dB	Config 1,2,3	0		
CP length		Config 1,2,3	Normal		
TimeToTrigger	s	Config 1,2,3	0		
Filter coefficient		Config 1,2,3	0		L3 filtering is not used
DRX		Config 1,2,3	OFF		DRX is not used
Time offset between serving and neighbour cells		Config 1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3µs		Synchronous cells
T1	s	Config 1,2,3	5		
T2	s	Config 1,2,3	TBD	TBD	

Table 6.6.2.3.4-3: Enviroment test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.x.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.x	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and TBD for TE part.		

1. Message contents are defined in clause 6.6.2.3.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

6.6.2.3.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 6.6.2.3.4-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table 6.6.2.3.4-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.4.4-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.4.4-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.2.1.4-2 as appropriate.

6.6.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.6.2.3.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED Table H.3.1-3 with Condition SSB.1 FR1, SMTC pattern 2 and Asynchronous cells for configuration 6.6.2.1-1 Table H.3.1-3 with Condition SSB.1 FR1, SMTC pattern 1 and synchronous cells for configuration 6.6.2.1-2 Table H.3.1-3 with Condition SSB.2 FR1, SMTC pattern 1 and synchronous cells for configuration 6.6.2.1-3 Table H.3.1-4 with A3-offset = -6dB and Condition SSB Index Table H.3.1-5 Table H.3.1-6 with Condition Pattern #0 for Test 1 and Test 2 Table H.3.1-6 with Condition Pattern #2 for Test 3 and Test 4 Table H.3.1-7 with Condition SSB Index

6.6.2.3.5 Test requirement

Table 6.6.2.4.5-1 defines the primary level settings including test tolerances for all tests.

Table A. 6.6.2.3.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection

Parameter		Unit	Test configuration	Cell 1 T1	Cell 1 T2	Cell 2 T1	Cell 2 T2
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD			
			Config 2,3	TDD			
TDD configuration			Config 1	Not Applicable			
			Config 2	TDDConf.1.1			
			Config 3	TDDConf.2.1			
$BW_{channel}$		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP BW		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP configuration	Initial DL BWP		Config 1, 2, 3	DLBWP.0.1			
	Dedicated DL BWP			DLBWP.1.1			
	Dedicated UL BWP			ULBWP.1.1			
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD		-	
			Config 2	SR.1.1 TDD			
			Config 3	SR2.1 TDD			
CORESET Reference Channel			Config 1	CR.1.1 FDD		-	
			Config 2	CR.1.1 TDD			
			Config 3	CR2.1 TDD			
SMTC configuration defined in A.3.11.1 and A.3.11. 2			Config 1	SMTC.2			
			Config 2, 3	SMTC.1			
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15			
			Config 3	30			
EPRE ratio of PSS to SSS			Config 1,2,3	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
N_{oc} Note2		dBm/15 kHz		-98			
N_{oc} Note2		dBm/SCS	Config 1,2	-98			
			Config 3	-95			
SS-RSRP Note 3		dBm/SCS	Config 1,2	-94	-94	-Infinity	-91
			Config 3	-91	-91	-Infinity	-88
$\hat{E}_s/I_{ot}$		dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$		dB	Config 1,2,3	4	4	-Infinity	7
Io Note3		dBm/9.36MHz	Config 1,2	-67.11	-67.11	-Infinity	-65.38

	dBm/38.16MHz	Config 3	-62.27	-62.27	-Infinity	-61.06
Propagation Condition		Config 1,2,3	AWGN			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.						

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI$_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.2.4 NR SA FR1-FR1 event-triggered reporting in DRX with SSB time index detection

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.
- Antenna diagram for TE Part 4Rx capable UEs without any 2Rx RF bands is TBD
- Message content contains TBDs
- Minimum conformance requirements contain [ ] and TBDs (RAN4 pending)
- Test requirement contains TBDs (RAN4 pending)
- Initial conditions contain TBDs (RAN4 pending)

6.6.2.4.1 Test purpose

To verify that the UE makes correct reporting of an event in DRX within inter-frequency NR cell search requirements with SSB time index detection in TS 38.133 [6] clause 9.3.4.

6.6.2.4.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.6.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.4.

6.6.2.4.4 Test description

6.6.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.4.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.2.4.4.1-2. Test environment parameters are given in Table 6.6.2.4.4.1-3.

Table 6.6.2.4.4.1-1: SA FR1-FR1 event triggered reporting tests in DRX with SSB time index detection supported test configurations

Test Case ID	Description
6.6.2.4-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.6.2.4-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.6.2.4-3	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 6.6.2.4.4-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
NR RF Channel Number		Config 1,2,3	1, 2				Two FR1 NR carrier frequencies is used
Active cell		Config 1,2,3	NR cell 1 (Pcell)				NR Cell 1 is on NR RF channel number 1
Neighbour cell		Config 1,2,3	NR cell2				NR cell 2 is on NR RF channel number 2
Gap Pattern Id		Config 1,2,3	0		2		As specified in TS 38.133 clause 9.1.2-1
Measurement gap offset		Config 1,2,3	39		39		
SMTC-SSB parameters		Config 1	SSB.1 FR1				As specified in TS 38.133 clause A.3.10.1
		Config 2	SSB.1 FR1				As specified in TS 38.133 clause A.3.10.1
		Config 3	SSB.2 FR1				As specified in TS 38.133 clause A.3.10.1
A3-Offset	dB	Config 1,2,3	-6				
Hysteresis	dB	Config 1,2,3	0				
CP length		Config 1,2,3	Normal				
TimeToTrigger	s	Config 1,2,3	0				
Filter coefficient		Config 1,2,3	0				L3 filtering is not used
DRX		Config 1,2,3	DRX.1	DRX.2	DRX.1	DRX.2	DRX is used
Time offset between serving and neighbour cells		Config 1	3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs				Synchronous cells
T1	s	Config 1,2,3	5				
T2	s	Config 1,2,3	TBD	TBD	TBD	TBD	

Table 6.6.2.4.4-3: Test Enviroment parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.x.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.x	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and TBD for TE part.		

1. Message contents are defined in clause 6.6.2.4.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Table Annex C.1.2.

6.6.2.4.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.6.6.2.4.4-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table.6.6.2.4.4-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.4.4-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.4.4-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures

the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
or:
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.2.1.4-2 as appropriate.

6.6.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.6.2.4.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED Table H.3.1-3 with Condition SSB.1 FR1, SMTC pattern 2 and Asynchronous cells for configuration 6.6.2.1-1 Table H.3.1-3 with Condition SSB.1 FR1, SMTC pattern 1 and synchronous cells for configuration 6.6.2.1-2 Table H.3.1-3 with Condition SSB.2 FR1, SMTC pattern 1 and synchronous cells for configuration 6.6.2.1-3 Table H.3.1-4 with A3-offset = -6dB and Condition SSB Index Table H.3.1-5 Table H.3.1-6 with Condition Pattern #0 for Test 1 and Test 2 Table H.3.1-6 with Condition Pattern #2 for Test 3 and Test 4 Table H.3.1-7 with Condition SSB Index Table H.3.7-1 with Condition DRX.1 for Test 1 and Test 3 Table H.3.7-1 with Condition DRX.2 for Test 2 and Test 4

6.6.2.4.5 Test requirement

Table 6.6.2.4.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.6.2.4.5-1 : Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection

Parameter		Unit	Test configuration	Cell 1 T1	Cell 1 T2	Cell 2 T1	Cell 2 T2
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD			
			Config 2,3	TDD			
TDD configuration			Config 1	Not Applicable			
			Config 2	TDDConf.1.1			
			Config 3	TDDConf.2.1			
$BW_{channel}$		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP BW		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP configuration	Initial DL BWP		Config 1, 2, 3	DLBWP.0.1			
	Dedicated DL BWP			DLBWP.1.1			
	Dedicated UL BWP			ULBWP.1.1			
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD		-	
			Config 2	SR.1.1 TDD			
			Config 3	SR2.1 TDD			
CORESET Reference Channel			Config 1	CR.1.1 FDD		-	
			Config 2	CR.1.1 TDD			
			Config 3	CR2.1 TDD			
SMTC configuration defined in A.3.11.1 and A.3.11. 2			Config 1	SMTC.2			
			Config 2, 3	SMTC.1			
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15			
			Config 3	30			
EPRE ratio of PSS to SSS			Config 1,2,3	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
N_{oc} Note2		dBm/15 kHz		-98+TT			
N_{oc} Note2		dBm/SCS	Config 1,2	-98+TT			
			Config 3	-95+TT			
SS-RSRP Note 3		dBm/SCS	Config 1,2	-94+TT	-94+TT	-Infinity	-91+TT
			Config 3	-91+TT	-91+TT	-Infinity	-88+TT
$\hat{E}_s/I_{ot}$		dB	Config 1,2,3,4,5,6	4+TT	4+TT	-Infinity	7+TT
$\hat{E}_s/N_{oc}$		dB	Config 1,2,3	4+TT	4+TT	-Infinity	7+TT
Io Note3		dBm/9.36MHz	Config 1,2	-67.11+TT	-67.11+TT	-Infinity	-65.38+TT

	dBm/38.16MHz	Config 3	-62.27+TT	-62.27+TT	-Infinity	-61.06+TT
Propagation Condition		Config 1,2,3	AWGN			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.						

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2 , 3 and 4 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.3 Inter-RAT Measurements

6.6.3.0 Minimum conformance requirements

6.6.3.0.1 Minimum conformance requirements for inter-RAT event triggered reporting to E-UTRAN FDD

The requirements are applicable for NR−E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements.

In the requirements, an E-UTRAN FDD cell is considered to be detectable when:

- RSRP related conditions in the accuracy requirements in Section 10.2.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],
- RSRQ related conditions in the accuracy requirements in Section 10.2.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],
- RS-SINR related conditions in the accuracy requirements in Section 10.2.5 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.19 of TS 36.133 [23].

When the UE requires measurement gaps to idenitify and measure inter-RAT cells and an appropriate measurement gap pattern is scheduled, the UE shall be able to identify a new detectable FDD cell within $T_{Identify,\ E\text{-}UTRAN\ FDD}$ according to the following expression:

$$T_{Identify,E-UTRAN\ FDD} = T_{BasicIdentify} * \frac{480}{T_{Inter1}} * CSSF_{interRAT} \quad ms,$$

where:

$T_{BasicIdentify}$ = 480 ms,

T_{Inter1} is defined in TS 38.133 [6] section 9.4.1,

$CSSF_{interRAT}$ = $CSSF_{within\_gap\_i\_}$ is the scaling factor for the measured inter-RAT E-UTRA carrier i which is calculated as specified in TS 38.133 [6] section 9.1.5.2.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of $T_{Measure,\ E-UTRAN\ FDD}$ defined in Table 6.6.3.0.1-1.

Table 6.6.3.0.1-1: Measurement period and measurement bandwidth

Configuration	Physical Layer Measurement period: $T_{Measure,\ E-UTRAN\ FDD}$ [ms]	Measurement bandwidth [RB]
0	480 x $CSSF_{interRAT}$	6
1 (note 1)	240 x $CSSF_{interRAT}$	50
NOTE 1: This configuration is optional.		

The UE shall be capable of identifying and performing NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements of at least 4 E-UTRAN FDD cells per E-UTRA FDD carrier frequency layer for up to 7 E-UTRA FDD carrier frequency layers.

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN FDD RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] section 10.2.2. The NR – E-UTRAN FDD RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] section 10.2.3. The NR – E-UTRAN FDD RS-SINR measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] section 10.2.5.

The reported NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered measurement reports shall meet the requirements in TS 38.133 [6] sections 10.2.2, 10.2.3, and 10.2.5, respectively.

The UE shall not send any event-triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH} where TTI_{DCCH} is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{Identify,\ E-UTRAN\ FDD}$ defined in TS 38.133 [6] sections 9.4.2.2 and 9.4.2.3 without DRX and with DRX, respectively. When L3 filtering is used, an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{Identify,\ E-UTRAN\ FDD}$ becomes undetectable for a period ≤ [5] seconds and then the cell becomes detectable again and triggers an event as per TS 38.331 [13], the event triggered measurement reporting delay shall be less than $T_{Measure,\ E-UTRAN\ FDD}$ provided the timing to that cell has not changed more than ± 50 Ts while measurement gap has not been available and the L3 filter has not been used.

The normative reference for this requirement is TS 38.133 [6] clause 9.4.2.

6.6.3.0.2 Minimum conformance requirements for inter-RAT event triggered reporting to E-UTRAN TDD

The requirements are applicable for NR−E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements.

In the requirements, an E-UTRAN TDD cell is considered to be detectable when:

- RSRP related conditions in the accuracy requirements in Section 10.2.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],
- RSRQ related conditions in the accuracy requirements in Section 10.2.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],

RS-SINR related conditions in the accuracy requirements in Section 10.2.5 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.19 of TS 36.133 [23].

When the UE requires measurement gaps to idenitify and measure inter-RAT cells and an appropriate measurement gap pattern is scheduled, the UE shall be able to identify a new detectable TDD cell within $T_{Identify,\ E\text{-}UTRAN\ TDD}$ according to the following expression:

- When configuration 0 or configuration 1 in Table 6.6.3.0.2-1 is applied,

$$T_{Identify,E-UTRAN\ TDD} = T_{BasicIdentify} * \frac{480}{T_{Inter1}} * CSSF_{interRAT} \quad ms\ ,$$

- When configuration 2 or configuration 3 in Table 6.6.3.0.2-1 is applied,

$$T_{Identify,E-UTRAN\ TDD} = (T_{BasicIdentify} * \frac{480}{T_{Inter1}} + 240) * CSSF_{interRAT} \quad ms,$$

where:

$T_{BasicIdentify}$ = 480 ms,

T_{Inter1} is defined in TS 38.133 [6] section 9.4.1,

$CSSF_{interRAT}$ = $CSSF_{within\_gap\_i\_}$ is the scaling factor for the measured inter-RAT E-UTRA carrier i which is calculated as specified in TS 38.133 [6] section 9.1.5.2.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of $T_{Measure,\ E\text{-}UTRAN\ TDD}$ defined in Table 6.6.3.0.2-1.

Table 6.6.3.0.2-1: $T_{Measure,\ E\text{-}UTRAN\ TDD}$ for different configurations

Configuration	Measurement bandwidth [RB]	Number of UL/DL sub-frames per half frame (5 ms)		DwPTS		$T_{Measure,\ E\text{-}UTRAN\ TDD}$ [ms]
		DL	UL	Normal CP	Extended CP	
0	6	2	2	$19760 \cdot T_s$	$20480 \cdot T_s$	480 x $CSSF_{interRAT}$
1 (note 1)	50	2	2	$19760 \cdot T_s$	$20480 \cdot T_s$	240 x $CSSF_{interRAT}$
NOTE 1: This configuration is optional.						

The UE shall be capable of identifying and performing NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements of at least 4 E-UTRAN TDD cells per E-UTRA TDD carrier frequency layer for up to 7 E-UTRA TDD carrier frequency layers.

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] section 10.2.2. The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] section 10.2.3. The NR – E-UTRAN TDD RS-SINR measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] section 10.2.5.

The reported NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered measurement reports shall meet the requirements in TS 38.133 [6] sections 10.2.2, 10.2.3, and 10.2.5, respectively.

The UE shall not send any event-triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH} where TTI_{DCCH} is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{\text{Identify, E-UTRAN TDD}}$ defined in TS 38.133 [6] sections 9.4.3.2 and 9.4.3.3 without DRX and with DRX, respectively. When L3 filtering is used, an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{\text{Identify, E-UTRAN TDD}}$ becomes undetectable for a period ≤ [5] seconds and then the cell becomes detectable again and triggers an event as per TS 38.331 [13], the event triggered measurement reporting delay shall be less than $T_{\text{Measure, E-UTRAN TDD}}$ provided the timing to that cell has not changed more than ± 50 Ts while measurement gap has not been available and the L3 filter has not been used.

The normative reference for this requirement is TS 38.133 [6] clause 9.4.3 and A.6.6.3.1.

6.6.3.1 NR SA FR1 – E-UTRAN event-triggered reporting in non-DRX

Editor's notes: This clause is incomplete, the following items are TBD

- *The core requirements in TS 38.133 are between [.] or TBD;*
- *Test tolerance analysis is missing;*
- *Test procedure and Message content are TBD;*
- *Cell mapping and Connection diagram is TBD;*
- *Test applicability Table in TS38.522 need to be updated.*

6.6.3.1.1 Test purpose

This test is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1 under the cell search and measurement requirements.

6.6.3.1.2 Test applicability

This test applies to all types of NR UE supporting SA FR1 from Release 15 onwards.

6.6.3.1.3 Minimum conformance requirements

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.3.1.

6.6.3.1.3.1 NR – E-UTRAN FDD requirement

The minimum conformance requirements are specified in clause 6.6.3.0.1.

6.6.3.1.3.2 NR – E-UTRAN TDD requirement

The minimum conformance requirements are specified in clause 6.6.3.0.2.

6.6.3.1.4 Test description

6.6.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.3.1.4.1-1.

Table 6.6.3.1.4.1-1: supported test configurations

Test Case ID	Description
6.6.3.1-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD
6.6.3.1-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD
6.6.3.1-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD
6.6.3.1-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD
6.6.3.1-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD
6.6.3.1-6	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD
NOTE: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.6.3.1.4.1-2 and Table 6.6.3.1.4.1-3.

Table 6.6.3.1.4.1-2: Initial conditions for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.1.2-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	N/A		

Table 6.6.3.1.4.1-3: General test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1

Parameter	Unit	Value	Comment
NR RF Channel Number		1	1 NR carrier frequency is used in the test
LTE RF Channel Number		1	1 LTE carrier frequency is used in the test
Channel Bandwidth	MHz	As specified in Tables 6.6.3.1.5-1 and 6.6.3.1.5-2.	
Active cell		Cell 1	Cell 1 is on RF channel number 1
Neighbour cell		Cell 2	Cell 2 is on RF channel number 2
Gap Pattern Id		0	As specified in Clause TS 38.133 [6] Table 9.1.2-1. Per-UE gap pattern.
NR measurement quantity		SS-RSRP	Measurement quantity for Cell 1
Inter-RAT E-UTRAN measurement quantity		RSRP	Measurement quantity for Cell 2
b2-Threshold1	dBm	note 1	SS-RSRP threshold for SS-RSRP measurement on cell1 for event B2
b2-Threshold2EUTRA	dBm	-95	E-UTRAN RSRP threshold for SS-RSRP measurement on cell1 for event B2
Hysteresis	dB	0	
TimeToTrigger	s	0	
Filter coefficient		0	L3 filtering is not used
DRX		OFF	OFF
T1	s	5	
T2	s	5	
NOTE 1: Values are defined in Table 6.6.3.1.5-1			

1. Message contents are defined in clause 6.6.3.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the neighbour NR Cell.

6.6.3.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG according to TS 38.508-1 [14] clause 4.5.
2. Configure MCG and SCG according to Annex C.1 for all downlink physical channels.
3. The SS shall configure the PCell (Cell 1) and PSCell (Cell 2) on the MCG and SCG as per TS 38.508-1 [14] clause 4.5 with the message content exceptions defined in clause 6.6.3.1.4.3.
4. Set the parameters according to T1 in Table 6.6.3.1.4.1-2. Propagation conditions are set according to Annex C clauses C.2.1 and C.2.2. T1 starts.
5. TBD.

6.6.3.1.4.3 Message contents

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

TBD

6.6.3.1.5 Test requirement

Table 6.6.3.1.5-1 and Table 6.6.3.1.5-2 defines the primary level settings including test tolerances for all tests.

Table 6.6.3.1.5-1: PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in non-DRX with PCell in FR1

Parameter		Unit	Configuration	Cell 1	
				T1	T2
RF channel number			1, 2, 3, 4, 5, 6	1	
Duplex mode			1, 2, 3	FDD	
			4, 5, 6	TDD	
TDD Configuration	SCS=15 KHz		2, 5	TDDConf.1.1	
	SCS=30 KHz		3, 6	TDDConf.2.1	
$BW_{channel}$		MHz	1, 4	10: $N_{RB,c}$ = 52 (FDD)	
			2, 5	10: $N_{RB,c}$ = 52 (TDD)	
			3, 6	40: $N_{RB,c}$ = 106 (TDD)	
PDSCH reference measurement channel			1, 4	SR.1.1 FDD	
			2, 5	SR.1.1 TDD	
			3, 6	SR.2.1 TDD	
CORSET reference channel			1, 4	CR.1.1 FDD	
			2, 5	CR.1.1 TDD	
			3, 6	CR.2.1 TDD	
BWP configurations	Initial DL BWP		1, 2, 3, 4, 5, 6	DLBWP.0	
	Dedicated DL BWP		1, 2, 3, 4, 5, 6	DLBWP.1	
	UL BWP		1, 2, 3, 4, 5, 6	ULBWP.1	
OCNG pattern note1			1, 2, 3, 4, 5, 6	OP.1	
SMTC configuration			1, 2, 3, 4, 5, 6	SMTC.1	
SSB configuration			1, 2, 4, 5	SSB.1 FR1	
			3, 6	SSB.2 FR1	
b2-Threshold1		dBm	1, 2, 4, 5	-89	
			3, 6	-86	
EPRE ratio of PSS to SSS		dB	1, 2, 3, 4, 5, 6	0	
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS					
EPRE ratio of OCNG to OCNG DMRS					
N_{oc} note2		dBm/15 KHz	1, 2, 3, 4, 5, 6	-104+TT	
N_{oc} note2		dBm/SCS	1, 2, 4, 5	-104+TT	
			3, 6	-101+TT	
$\hat{E}_s/N_{oc}$		dB	1, 2, 3, 4, 5, 6	17+TT	7+TT
$\hat{E}_s/I_{ot}$ note3		dB	1, 2, 3, 4, 5, 6	17+TT	7+TT
SS-RSRP note3		dBm/SCS	1, 2, 4, 5	-87+TT	-97+TT
			3, 6	-84+TT	-94+TT
SSB_RP note3		dBm/SCS	1, 2, 4, 5	-87+TT	-97+TT
			3, 6	-84+TT	-94+TT
Io note3		dBm/9.36 MHz	1, 2, 4, 5	-58.96+TT	-68.26+TT
		dBm/38.16 MHz	3, 6	-52.87+TT	-62.17+TT
Propagation condition			1, 2, 3, 4, 5, 6	ETU70	
Antenna Configuration and Correlation Matrix			1, 2, 3, 4, 5, 6	1x2 Low	

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.6.3.1.5-2: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1

Parameter	Unit	Configuration	Cell 2	
			T1	T2
RF channel number		1, 2, 3, 4, 5, 6	2	
Duplex mode		1, 2, 3	FDD	
		4, 5, 6	TDD	
TDD special subframe configuration note1		4, 5, 6	6	
TDD uplink-downlink configuration note1		4, 5, 6	1	
$BW_{channel}$	MHz	1, 2, 3, 4, 5, 6	5MHz: $N_{RB,c}$ = 25 10MHz: $N_{RB,c}$ = 50 20MHz: $N_{RB,c}$ = 100	
PDSCH parameters: DL Reference Measurement Channel note2		1, 2, 3	5MHz: R.7 FDD 10MHz: R.3 FDD 20MHz: R.6 FDD	
		4, 5, 6	5MHz: R.4 TDD 10MHz: R.0 TDD 20MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel note2		1, 2, 3	5MHz: R.11 FDD 10MHz: R.6 FDD 20MHz: R.10 FDD	
		4, 5, 6	5MHz: R.11 TDD 10MHz: R.6 TDD 20MHz: R.10 TDD	
OCNG Patterns note2		1, 2, 3	5MHz: OP.20 FDD 10MHz: OP.10 FDD 20MHz: OP.17 FDD	
		4, 5, 6	5MHz: OP.9 TDD 10MHz: OP.1 TDD 20MHz: OP.7 TDD	
PBCH_RA	dB	1, 2, 3, 4, 5, 6	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA note3				
OCNG_RB note3				
N_{oc} note4	dBm/15kHz	1, 2, 3, 4, 5, 6	-104+TT	
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	17+TT
$\hat{E}_s/I_{ot}$ note5	dB	1, 2, 3, 4, 5, 6	-Infinity	17+TT
RSRP note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87+TT
SCH_RP note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87+TT
Io note5	dBm/9MHz	1, 2, 3, 4, 5, 6	-76.22+10log ($N_{RB,c}$ /50) +TT	-59.13+10log ($N_{RB,c}$ /50) +TT
Propagation Condition not 6		1, 2, 3, 4, 5, 6	ETU70	
Antenna Configuration and Correlation Matrix note6		1, 2, 3, 4, 5, 6	1x2 Low	

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 6: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [yy]. Editor's note: spec is not listed!

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [800] ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.7 Measurement performance requirements

6.7.1 SS-RSRP

6.7.1.0 Minimum conformance requirements

6.7.1.0.1 Intra-frequency absolute SS-RSRP measurement accuracy requirements

Same as in clause 4.7.1.0.1.

6.7.1.0.2 Intra-frequency relative SS-RSRP measurement accuracy requirements

Same as in clause 4.7.1.0.2.

6.7.1.0.3 Inter-frequency absolute SS-RSRP measurement accuracy requirements

Same as in clause 4.7.1.0.3.

6.7.1.0.4 Inter-frequency relative SS-RSRP measurement accuracy requirements

Same as in clause 4.7.1.0.4.

6.7.1.1 Intra-frequency measurements

6.7.1.1.1 NR SA FR1 SS-RSRP absolute measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

6.7.1.1.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

6.7.1.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.1.1.

6.7.1.1.1.4 Test description

6.7.1.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.1.1.1.4.1-1.

Table 6.7.1.1.1.4.1-1: NR SA FR1 SS-RSRP measurement accuracy supported test configurations

Test Case ID	Description
6.7.1.1.1-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.1.1.1-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.1.1.1-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.1.1.1.4.1-2.

Table 6.7.1.1.1.4.1-2: Initial conditions for SS-RSRP intra frequency absolute accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.1.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.1.1.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in the same frequency and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.7.1.1.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.7.1.1.1.5-1 as appropriate.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit an RRCConnectionReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport. The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in Table 6.7.1.1.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Repeat steps 1-7 for each sub-test in Table 6.7.1.1.1.5-1 as appropriate.

6.7.1.1.1.4.3 Message contents

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

TBD

6.7.1.1.1.5 Test requirement

Table 6.7.1.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 6.7.1.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.1.1.1.5-2.

Table 6.7.1.1.1.5-1: NR SA FR1 SS-RSRP measurement accuracy test parameters

Parameter		Unit	Test 1		Test 2		Test 3	
			Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN			freq1		freq1		freq1	
Duplex mode	Config 1		FDD					
	Config 2,3		TDD					
TDD configuration	Config 1		Not Applicable					
	Config 2		TDDConf.1.1					
	Config 3		TDDConf.2.1					
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52					
	Config 2		10: $N_{RB,c}$ = 52					
	Config 3		40: $N_{RB,c}$ = 106					
BWP BW	Config 1		10: $N_{RB,c}$ = 52					
	Config 2		10: $N_{RB,c}$ = 52					
	Config 3		40: $N_{RB,c}$ = 106					
Downlink initial BWP configuration			DLBWP.0					
Downlink dedicated BWP configuration			DLBWP.1					
Uplink dedicated BWP configuration			ULBWP.1					
DRx Cycle		ms	Not Applicable					
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD	-	SR.1.1 FDD	-	SR.1.1 FDD	-
	Config 2		SR.1.1 TDD		SR.1.1 TDD		SR.1.1 TDD	
	Config 3		SR2.1 TDD		SR2.1 TDD		SR2.1 TDD	
RMSI CORESET Reference Channel	Config 1		CR.1.1 FDD	-	CR.1.1 FDD	-	CR.1.1 FDD	-
	Config 2		CR.1.1 TDD		CR.1.1 TDD		CR.1.1 TDD	
	Config 3		CR2.1 TDD		CR2.1 TDD		CR2.1 TDD	
Control Channel RMC	Config 1		CCR.1.1 FDD	-	CCR.1.1 FDD	-	CCR.1.1 FDD	-
	Config 2		CCR.1.1 TDD		CCR.1.1 TDD		CCR.1.1 TDD	
	Config 3		CR2.1 TDD		CCR2.1 TDD		CCR2.1 TDD	
SSB configuration	Config 1		SSB 1.FR1	-	SSB 1.FR1	-	SSB 1.FR1	-
	Config 2		SSB 1.FR1		SSB 1.FR1		SSB 1.FR1	
	Config 3		SSB 2.FR1		SSB 2.FR1		SSB 2.FR1	
SMTC configuration			SMTC 1					
OCNG Patterns			OP.1					
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz					
	Config 3		30kHz					
EPRE ratio of PSS to SSS		dB	0	0	0	0	0	0
EPRE ratio of PBCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS								
EPRE ratio of PDCCH DMRS to SSS								
EPRE ratio of PDCCH to PDCCH DMRS								
EPRE ratio of PDSCH DMRS to SSS								
EPRE ratio of PDSCH to PDSCH								
EPRE ratio of OCNG DMRS to SSS(Note 1)								
EPRE ratio of OCNG to OCNG DMRS (Note 1)								

N_{oc} Note2	Config 1,2	Depending on band group	dBm/15KhZ	-106±TT		-88±TT		-116 ±TT + Δ_{BG_offset}	
	Config 3	Depending on band group		-113±TT		-94±TT		116 ±TT + Δ_{BG_offset}	
N_{oc} Note2	Config 1,2		dBm/SCS	-106±TT		-88±TT		Same as Noc/15kHz	
	Config 3	Depending on band group		-110±TT		-91±TT		-113±TT + Δ_{BG_offset}	
$\hat{E}_s/I_{ot}$			dB	2.5±TT	-6±TT	2.5±TT	-6±TT	0.46±TT	-5.76±TT
$\hat{E}_s/N_{oc}$			dB	6±TT	1±TT	6±TT	1±TT	3±TT	-1±TT
SS-RSRP Note3	Config 1,2	Depending on band group	dBm/SCS	-100±TT	-105±TT	-82±TT	-87±TT	-113±TT + Δ_{BG_offset}	-117±TT + Δ_{BG_offset}
	Config 3	Depending on band group		-106±TT	-109±TT	-85±TT	-90±TT	-110±TT + Δ_{BG_offset}	-114±TT + Δ_{BG_offset}
Io Note3	Config 1,2	Depending on band group	dBm/ 9.36MHz	-70.09±TT		-52.09±TT		-82.26±TT + Δ_{BG_offset}	
	Config 3	Depending on band group	dBm/ 38.16MHz	-70.99±TT		-51.99±TT		-76.16±TT + Δ_{BG_offset}	
Propagation condition			-	AWGN					
Antenna configuration				1x2					

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

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

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.

Table 6.7.1.1.1.5-2: SS-RSRP Intra frequency absolute accuracy requirements for the reported values

Normal Conditions	Test 1 All bands	Test 2 All bands	Test 3	
Lowest reported value (Cell 2)	TBD	TBD	Bands FDD_A	TBD
			Bands FDD_B1, FDD_B2	TBD
			Bands FDD_C	TBD
			Bands FDD_D	TBD
			Bands FDD_E, FDD_F	TBD
			Bands FDD_G	TBD
			Bands FDD_H	TBD
Highest reported value (Cell 2)	TBD	TBD	Bands FDD_A	TBD
			Bands FDD_B1, FDD_B2	TBD
			Bands FDD_C	TBD
			Bands FDD_D	TBD
			Bands FDD_E, FDD_F	TBD
			Bands FDD_G	TBD
			Bands FDD_D	TBD
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**	**Test 3**	
Lowest reported value (Cell 2)	TBD	TBD	Bands FDD_A	TBD
			Bands FDD_B1, FDD_B2	TBD
			Bands FDD_C	TBD
			Bands FDD_D	TBD
			Bands FDD_E, FDD_F	TBD
			Bands FDD_G	TBD
			Bands FDD_H	TBD
Highest reported value (Cell 2)	TBD	TBD	Bands FDD_A	TBD
			Bands FDD_B1, FDD_B2	TBD
			Bands FDD_C	TBD
			Bands FDD_D	TBD
			Bands FDD_E, FDD_F	TBD
			Bands FDD_G	TBD
			Bands FDD_H	TBD
Note 1: E-UTRA operating band groups are as defined in Section 3.5.				

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.1.1.2 NR SA FR1 SS-RSRP relative measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

6.7.1.1.2.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP relative measurement accuracy is within the specified limits for all bands.

6.7.1.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.1.1.

6.7.1.1.2.4 Test description

6.7.1.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.1.1.2.4.1-1.

Table 6.7.1.1.2.4.1-1: NR SA FR1 SS-RSRP measurement accuracy supported test configurations

Test Case ID	Description
6.7.1.1.2-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.1.1.2-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.1.1.2-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.1.1.2.4.1-2.

Table 6.7.1.1.2.4.1-2: Initial conditions for SS-RSRP intra frequency relative accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.1.1.2.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in the same frequency and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.7.1.1.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED CONNECTED with generic procedure parameters Connectivity *NR* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 6.7.1.1.2.5-1 as appropriate.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values of Cell 1 and Cell 2 in the periodic MeasurementReport. The SS-RSRP value of Cell 3 reported by the UE is compared to the reported SS-RSRP of Cell 2. If the resulting value is outside the limits in Table 6.7.1.1.2.5-2 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Repeat steps 1-7 for each sub-test in Table 6.7.1.1.2.5-1 as appropriate.

6.7.1.1.2.4.3 Message contents

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

TBD

6.7.1.1.2.5 Test requirement

Table 6.7.1.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 6.7.1.1.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.1.1.2.5-2.

Table 6.7.1.1.2.5-1: Same as Table 6.7.1.1.1.5-1

Table 6.7.1.1.2.5-2: SS-RSRP Intra frequency relative accuracy requirements for the reported values

	Test 1	Test 2	Test 3
	All bands	All bands	All bands
Normal Conditions			
Lowest reported value (Cell 2)	RSRP_x - TBD	RSRP_x - TBD	RSRP_x - TBD
Highest reported value (Cell 2)	RSRP_x + TBD	RSRP_x + TBD	RSRP_x + TBD
Extreme Conditions			
Lowest reported value (Cell 2)	RSRP_x - TBD	RSRP_x - TBD	RSRP_x - TBD
Highest reported value (Cell 2)	RSRP_x + TBD	RSRP_x + TBD	RSRP_x + TBD
RSRP_x is the reported value of Cell 1			

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.1.2 Inter-frequency measurements

6.7.1.2.1 NR SA FR1-FR1 SS-RSRP absolute measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

6.7.1.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

6.7.1.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.1.2.

6.7.1.2.1.4 Test description

6.7.1.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.1.2.1.4.1-1.

Table 6.7.1.2.1.4.1-1: NR SA FR1-FR1 SS-RSRP measurement accuracy supported test configurations

Test Case ID	Description
6.7.1.2.1-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.1.2.1-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.1.2.1-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.1.2.1.4.1-2.

Table 6.7.1.2.1.4.1-2: Initial conditions for SS-RSRP inter frequency absolute accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.1.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.1.2.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in a different FR1 frequency and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.7.1.2.1.4.2 Test procedure

Same as in clause 6.7.1.1.1.4.2 but replacing Table 6.7.1.1.1.5-1 and 6.7.1.1.1.5-2 with 6.7.1.2.1.5-1 and 6.7.1.2.1.5-2, respectively.

6.7.1.2.1.4.3 Message contents

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

TBD

6.7.1.2.1.5 Test requirement

TBD

6.7.1.2.2 NR SA FR1-FR1 SS-RSRP relative measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

6.7.1.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

6.7.1.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.1.2.

6.7.1.2.2.4 Test description

6.7.1.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.1.2.2.4.1-1.

Table 6.7.1.2.2.4.1-1: NR SA FR1-FR1 SS-RSRP relative measurement accuracy supported test configurations

Test Case ID	Description
6.7.1.2.2-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.1.2.2-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.1.2.2-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.1.2.2.4.1-2.

Table 6.7.1.2.2.4.1-2: Initial conditions for SS-RSRP inter frequency relative accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.1.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3. 1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.1.2.2.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in a different FR1 frequency and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.7.1.2.2.4.2 Test procedure

Same as in clause 6.7.1.1.2.4.2 but replacing Table 6.7.1.1.2.5-1 and 6.7.1.1.2.5-2 with 6.7.1.2.2.5-1 and 6.7.1.2.2.5-2, respectively.

6.7.1.2.2.4.3 Message contents

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

TBD

6.7.1.2.2.5 Test requirement

TBD

6.7.2 SS-RSRQ

6.7.2.0 Minimum conformance requirements

6.7.2.0.1 Intra-frequency SS-RSRQ measurement accuracy requirements

Same as in clause 4.7.2.0.1.

6.7.2.0.2 Inter-frequency SS-RSRQ measurement accuracy requirements

Same as in clause 4.7.2.0.2.

6.7.2.1 NR SA FR1 SS-RSRQ measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- The core requirements in TS 38.133 are between [.] or TBD.

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

6.7.2.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRQ measurement accuracy is within the specified limits for all bands.

6.7.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.2.1.

6.7.2.1.4 Test description

6.7.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.2.1.4.1-1.

Table 6.7.2.1.4.1-1: NR SA FR1 SS-RSRQ measurement accuracy supported test configurations

Test Case ID	Description
6.7.2.1-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.2.1-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.2.1-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.2.1.4.1-2.

Table 6.7.2.1.4.1-2: Initial conditions for SS-RSRQ intra frequency accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.2.1.4.3.

2. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is an NR FR1 cell in the same frequency as Cell 1. Cell 2 is the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in Annex C.1.1.

6.7.2.1.4.2 Test procedure

TBD

6.7.2.1.4.3 Message contents

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

TBD

6.7.2.1.5 Test requirement

TBD

6.7.2.2 NR SA FR1-FR1 SS-RSRQ measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- The core requirements in TS 38.133 are between [.] or TBD.

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

6.7.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRQ measurement accuracy is within the specified limits for all bands.

6.7.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.2.2.

6.7.2.2.4 Test description

6.7.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.2.2.4.1-1.

Table 6.7.2.2.4.1-1: NR SA FR1-FR1 SS-RSRQ measurement accuracy supported test configurations

Test Case ID	Description
6.7.2.2-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.2.2-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.2.2-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.2.2.4.1-2.

Table 6.7.2.2.4.1-2: Initial conditions for SS-RSRQ inter frequency accuracy in FR1

<table>
<tr><th>Parameter</th><th colspan="2">Value</th><th>Comment</th></tr>
<tr><td>Test environment</td><td colspan="2">NC, TL/VL, TL/VH, TH/VL, TH/VH</td><td>As specified in TS 38.508-1 [14] clause 4.1.</td></tr>
<tr><td>Test frequencies</td><td colspan="3">As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.</td></tr>
<tr><td>Channel bandwidth</td><td colspan="3">As specified by the test configuration selected from Table 6.7.2.1.4.1-1.</td></tr>
<tr><td>Propagation conditions</td><td colspan="2">AWGN</td><td>As specified in Annex C.2.2.</td></tr>
<tr><td rowspan="2">Connection Diagram</td><td>TE Part</td><td>A.3.1.8.2 with n = 2 and φ_1 = 5 Hz</td><td rowspan="2">As specified in TS 38.508-1 [14] Annex A.</td></tr>
<tr><td>DUT Part</td><td>A.3.2.3.4</td></tr>
<tr><td>Exceptions to connection diagram</td><td colspan="2">N/A</td><td></td></tr>
</table>

1. Message contents are defined in clause 6.7.2.2.4.3.
2. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is an NR FR1 cell in the same frequency as Cell 1. Cell 2 is the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in Annex C.1.1.

6.7.2.2.4.2 Test procedure

TBD

6.7.2.2.4.3 Message contents

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

TBD

6.7.2.2.5 Test requirement

TBD

6.7.3 SS-SINR

6.7.4 L1-RSRP

6.7.4.0 Minimum conformance requirements

6.7.4.0.1 SSB based absolute L1-RSRP measurement accuracy requirements

Same as 4.7.4.0.1.

6.7.4.0.2 SSB based relative L1-RSRP measurement accuracy requirements

Same as 4.7.4.0.2.

6.7.4.0.3 CSI-RS based absolute L1-RSRP measurement accuracy requirements

Same as 4.7.4.0.3.

6.7.4.0.4 CSI-RS based relative L1-RSRP measurement accuracy requirements

Same as 4.7.4.0.4.

6.7.4.1 SSB based L1-RSRP measurements

6.7.4.1.1 NR SA FR1 SSB based L1-RSRP absolute measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- The core requirements in TS 38.133 are between [.] or TBD.

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

6.7.4.1.1.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

6.7.4.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.4.1.

6.7.4.1.1.4 Test description

6.7.4.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.4.1.1.4.1-1.

Table 6.7.4.1.1.4.1-1: NR SA FR1 SSB based L1-RSRP absolute measurement accuracy supported test configurations

Test Case ID	Description
6.7.4.1.1-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.4.1.1-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.4.1.1-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.4.1.1.4.1-2.

Table 6.7.4.1.1.4.1-2: Initial conditions for SSB based L1-RSRP absolute accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.4.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.4.1.1.4.3.

2. Cell 1 is the NR FR1 cell. Cell 1 is the target for SSB based L1-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1.

6.7.4.1.1.4.2 Test procedure

TBD

6.7.4.1.1.4.3 Message contents

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

TBD

6.7.4.1.1.5 Test requirement

TBD

6.7.4.1.2 NR SA FR1 SSB based L1-RSRP relative measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- The core requirements in TS 38.133 are between [.] or TBD.

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

6.7.4.1.2.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

6.7.4.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.4.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.4.1.

6.7.4.1.2.4 Test description

6.7.4.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.4.1.2.4.1-1.

Table 6.7.4.1.2.4.1-1: NR SA FR1 SSB based L1-RSRP relative measurement accuracy supported test configurations

Test Case ID	Description
6.7.4.1.2-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.4.1.2-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.4.1.2-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.4.1.2.4.1-2.

Table 6.7.4.1.2.4.1-2: Initial conditions for SSB based L1-RSRP relative accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.4.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.4.1.2.4.3.
2. Cell 1 is the NR FR1 cell. Cell 1 is the target for SSB base L1-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1.

6.7.4.1.2.4.2 Test procedure

TBD

6.7.4.1.2.4.3 Message contents

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

TBD

6.7.4.1.2.5 Test requirement

TBD

6.7.4.2 CSI-RS based L1-RSRP measurements

6.7.4.2.1 NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- The core requirements in TS 38.133 are between [.] or TBD.

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

6.7.4.2.1.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

6.7.4.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.4.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.4.2.

6.7.4.2.1.4 Test description

6.7.4.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.4.2.1.4.1-1.

Table 6.7.4.2.1.4.1-1: NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy supported test configurations

Test Case ID	Description
6.7.4.2.1-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.4.2.1-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.4.2.1-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.4.2.1.4.1-2.

Table 6.7.4.2.1.4.1-2: Initial conditions for CSI-RS based L1-RSRP absolute accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.4.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.4.2.1.4.3.
2. Cell 1 is the NR FR1 cell. Cell 1 is the target for CSI-RS based L1-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1.

6.7.4.2.1.4.2 Test procedure

TBD

6.7.4.2.1.4.3 Message contents

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

TBD

6.7.4.2.1.5 Test requirement

TBD

6.7.4.2.2 NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- The core requirements in TS 38.133 are between [.] or TBD.

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

6.7.4.2.2.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

6.7.4.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.4.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.4.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.4.2.

6.7.4.2.2.4 Test description

6.7.4.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.4.2.2.4.1-1.

Table 6.7.4.2.2.4.1-1: NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy supported test configurations

Test Case ID	Description
6.7.4.2.2-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.4.2.2-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.4.2.2-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.4.2.2.4.1-2.

Table 6.7.4.2.2.4.1-2: Initial conditions for CSI-RS based L1-RSRP relative accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.4.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.4.2.2.4.3.

2. Cell 1 is the NR FR1 cell. Cell 1 is the target for CSI-RS based L1-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1.

6.7.4.2.2.4.2 Test procedure

TBD

6.7.4.2.2.4.3 Message contents

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

TBD

6.7.4.2.2.5 Test requirement

TBD

7 NR standalone with at least one NR cell in FR2

This section contains test scenarios for NR standalone. This configuration is also known as SA Option 2. At least one NR cell is in Frequency Range 2.

7.1 RRC_IDLE state mobility

7.2 RRC_INACTIVE state mobility

7.3 RRC_CONNECTED state mobility

7.3.1 Handover

7.3.2 RRC connection mobility control

7.3.2.1 RRC re-establishment

7.3.2.2 Random access

7.3.2.3 RRC connection release with redirection

7.4 Timing

7.4.1 UE transmit timing

7.4.2 UE timer accuracy

7.4.3 Timing advance

7.5 Signaling characteristics

7.5.1 Radio link monitoring

7.5.2 Interruption

7.5.3 SCell activation and deactivation delay

7.5.4 UE UL carrier RRC reconfiguration delay

7.5.5 Link recovery procedures

7.5.5.1 NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- Test requirements are between brackets.

- Some parameters are TBD

7.5.5.1.1 Test purpose

The purpose of this test is:

To verify that the UE properly detects SSB-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candicate set q_1.

To test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used.

To partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

7.5.5.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

7.5.5.1.3 Minimum conformance requirements

[TS 38.133 [6], clause 8.5.2.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured SSB resource in set $\bar{q}_0$ estimated over the last $T_{Evaluate\_BFD\_SSB}$ [ms] period becomes worse than the threshold $Q_{out\_LR\_SSB}$ within $T_{Evaluate\_BFD\_SSB}$ [ms] period.

The value of $T_{Evaluate\_BFD\_SSB}$ is defined in Table 7.5.5.1.3-1 with N=8

For FR2,

- P=1/(1 – $T_{SSB}/T_{SMTCperiod}$), when BFD-RS is not overlapped with measurement gap and BFD-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$).
- P is $P_{sharing\ factor}$, when BFD-RS is not overlapped with measurement gap and BFD-RS is fully overlapped with SMTC period ($T_{SSB} = T_{SMTCperiod}$).
- P is 1/(1- T_{SSB}/MGRP - $T_{SSB}/T_{SMTCperiod}$), when BFD-RS is partially overlapped with measurement gap and BFD-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq$ MGRP or
  - $T_{SMTCperiod}$ = MGRP and $T_{SSB} < 0.5*T_{SMTCperiod}$
- P is 1/(1- T_{SSB} /MGRP)* $P_{sharing\ factor}$, when BFD-RS is partially overlapped with measurement gap and BFD-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{SSB} = 0.5*T_{SMTCperiod}$
- P is 1/{1- T_{SSB} /min ($T_{SMTCperiod}$,MGRP)}, when BFD-RS is partially overlapped with measurement gap (T_{SSB} <MGRP) and BFD-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.
- P is 1/(1- T_{SSB} /MGRP)* $P_{sharing\ factor}$, when BFD-RS is partially overlapped with measurement gap and BFD-RS is fully overlapped with SMTC occasion ($T_{SSB} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)
- $P_{sharing\ factor}$ = 3.

If the high layer in TS 38.331 [13] signaling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

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

Table 7.5.5.1.3-1: Evaluation period $T_{Evaluate\_BFD\_out}$ for FR2

Configuration	$T_{Evaluate\_BFD\_SSB}$ (ms)
no DRX	max([50], ceil(5*P*N)*T_{SSB})
DRX cycle ≤ 320ms	max([50], ceil(7.5*P*N)*max(T_{DRX},T_{SSB}))
DRX cycle > 320ms	ceil(5*P*N)*T_{DRX}
Note: T_{SSB} is the periodicity of SSB in the set $\overline{q}_0$. T_{DRX} is the DRX cycle length.	

[TS 38.133 [6], clause 8.5.4]

When the radio link quality on all the configured RS resources in set $\overline{q}_0$ is worse than Q_{out_LR}, Layer 1 of the UE shall send a beam failure instance indication to the higher layers. A Layer 3 filter may be applied to the beam failure instance indications as specified in TS 38.331 [13].

The beam failure instance evaluation for the configured RS resources in set $\overline{q}_0$ shall be performed as specified in section 6 in TS 38.213 [8]. Two successive indications from Layer 1 shall be separated by at least $T_{Indication\_interval\_BFD}$.

When DRX is not used, $T_{Indication\_interval\_BFD}$ is max(2ms, $T_{BFD-RS,M}$), where $T_{BFD-RS,M}$ is the shortest periodicity of all configured RS resources in set $\overline{q}_0$ for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set $\overline{q}_0$ or CSI-RS resource in the set $\overline{q}_0$.

When DRX is used, $T_{Indication\_interval\_BFD}$ is max(1.5*DRX_cycle_length, 1.5*$T_{BFD-RS,M}$) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication\_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms.[TS 38.133 [6], clause 8.5.5.2]

UE shall be able to evaluate whether the L1-RSRP measured on the configured SSB resource in set $\overline{q}_1$ estimated over the last $T_{Evaluate\_CBD\_SSB}$ [ms] period becomes better than the threshold Q_{in_LR}.

The value of $T_{Evaluate\_CBD\_SSB}$ is defined in Table 7.5.5.1.3-2 for FR2 with N=8.

For FR2,

- P=1/(1 – T_{SSB}/$T_{SMTCperiod}$), when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$).
- P is 3, when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC period ($T_{SSB} = T_{SMTCperiod}$).
- P is 1/(1- T_{SSB}/MGRP - T_{SSB}/$T_{SMTCperiod}$), when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq$ MGRP or
  - $T_{SMTCperiod}$ = MGRP and $T_{SSB} < 0.5*T_{SMTCperiod}$
- P is 1/(1- T_{SSB} /MGRP)*3, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{SSB} = 0.5*T_{SMTCperiod}$
- P is 1/{1- T_{SSB} /min ($T_{SMTCperiod}$,MGRP)}, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap
- P is 1/(1- T_{SSB} /MGRP)*3, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion ($T_{SSB} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)

[Longer evaluation period would be expected if the SSB is on the same OFDM symbols with RLM/BFD/BM-RS, or other CBD-RS, according to the measurement restrictions defined in section TBD.]

Table 7.5.5.1.3-2: Evaluation period $T_{Evaluate\_CBD\_out}$ for FR2

Configuration	$T_{Evaluate\_CBD\_SSB}$ (ms)
non-DRX	ceil([3]*P*N) * T_{SSB}
DRX cycle ≤ 320ms	ceil([3]*P*N*1.5) * max(T_{DRX},T_{SSB})
DRX cycle > 320ms	ceil([3]*P*N) * T_{DRX}
Note: T_{SSB} is the periodicity of SSB in the set $\overline{q}_1$. T_{DRX} is the DRX cycle length.	

The normative reference for this requirement is TS 38.133 [6] clauses 8.5.2.2, 8.5.4, 8.5.5.2 and A.7.5.5.1.

7.5.5.1.4 Test description

The test consists of two subtests with one NR serving cell configured. The difference between the two subtests is whether the measurement gap is configured on the NR serving Cell or not. Each subtest consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.1.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate SSB based beam failure.

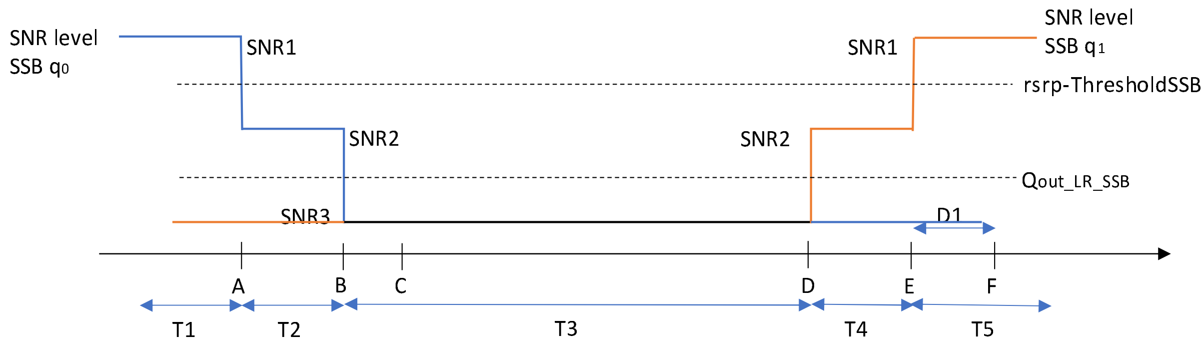


Figure 7.5.5.1.4-1: SNR variation SSB for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

7.5.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.1.4.1-1.

Table 7.5.5.1.4.1-1: Supported test configurations for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Configuration	Description
1	TDD duplex mode, 120 kHz SSB SCS, 100MHz bandwidth
2	TDD duplex mode, 240 kHz SSB SCS, 100MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR2	

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.1.4.1-2.

Table 7.5.5.1.4.1-2: Initial conditions for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.5.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.5.1.4.1-3. The measurement gap configuration for sub-test 2 is according to Table 7.5.5.1.4.1-4.

2. Message contents are defined in clause 7.5.5.1.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.1.4.1-3: General test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Parameter		Unit	Value Test 1	Value Test 2	Comment
Active PCell			Cell 1	Cell 1	
RF Channel Number			1	1	
Duplex mode	Config 1		TDD	TDD	
	Config 2		TDD	TDD	
TDD Configuration	Config 1		[TDDConf.3.1]	[TDDConf.3.1]	
	Config 2		[TDDConf.3.1]	[TDDConf.3.1]	
CORESET Reference Channel	Config 1		[CR. 3.1 TDD]	[CR. 3.1 TDD]	
	Config 2		[CR. 3.1 TDD]	[CR. 3.1 TDD]	
SSB Configuration	Config 1		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)	
	Config 2		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)	
SMTC Configuration	Config 1		TDD	TDD	
	Config 2		TDD	TDD	
PDSCH/ PDCCH subcarrier spacing	Config 1		120 KHz	120 KHz	
	Config 2		120 KHz	120 KHz	
csi-RS-Index assigned as RLM RS			[0]	[0]	
OCNG parameters			TBD	TBD	
CP length			Normal	Normal	
Correlation Matrix and Antenna Configuration			[2x2 Low]	[2x2 Low]	
Beam failure detection trans mission parameters	DCI format		1-0	1-0	
	Number of Control OFDM symbols		2	2	
	Aggregation level	CCE	8	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	0	
	DMRS precoder granularity		REG bundle size	REG bundle size	
	REG bundle size		6	6	
DRX			OFF	OFF	
Gap pattern ID			[N.A.]	*[*gp0*]	
ssb-Index			2	2	Number of SSB indexes used for beam failure detection

rlmInSyncOutOfSync Threshold			absent	absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).
rsrp-ThresholdSSB			TBD	TBD	Threshold used for $Q_{out\_LR\_SSB}$
powerControlOffsetSS			NA	NA	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstance MaxCount			[n2]	[n2]	see TS 38.321 [7], section 5.17
beamFailureDetection Timer			[pbfd4]	[pbfd4]	see TS 38.321 [7], section 5.17
ZP CSI-RS configuation			TBD	TBD	
CSI-IM configuration			TBD	TBD	
Periodic CSI reporting			PUCCH	PUCCH	
CSI reporting periodicity	Config 1, 2	slot	[5]	[5]	
	Config 3		[10]	[10]	
T1		s	1	1	During this time the UE shall be fully synchronized to cell 1
T2		s	0.4	0.4	
T3		s	[0.6]	[0.6]	
D1		s	[0.24]	[0.44]	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.					

Table 7.5.5.1.4.1-4: Measurement gap configuration for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Field	Test 2
	Value
gapOffset	[0]

7.5.5.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in subtest 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.1.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.1.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.1.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.1.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.1.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B and

b) does not detect any uplink power on NR carrier higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C until T3 expires

and

c) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point F (D1 after the start of T5) until T5 expires,

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.1.5-1.
9. Wait [1s] for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within [1s] continue to step 11. Otherwise continue to step 10.
10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.
11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.5.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.5.5.1.4.3-1: Common Exception messages for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	TBD

7.5.5.1.5 Test requirement

Tables 7.5.5.1.4.1-3 and 7.5.5.1.5-1 define the primary level settings including test tolerances for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX.

Table 7.5.5.1.5-1: NR Cell specific test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Parameter		Unit	Test 1 and Test 2					Test 1 and Test 2				
			SSB of set q_0					SSB of set q_1				
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
PDCCH_beta		dB	4					4				
PDCCH_DMRS_beta		dB	4					4				
PBCH_beta		dB	0					0				
PSS_beta		dB										
SSS_beta		dB										
PDSCH_beta		dB										
OCNG_beta		dB										
SNR	Config 1	dB	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Config 2		TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Config 3		TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N_{oc}	Config 1	dBm/ 15K Hz	[-98]					[-98]				
	Config 2		[-98]					[-98]				
	Config 3		[-98]					[-98]				
Propagation condition			[TDL-C 300ns 100Hz]					[TDL-C 300ns 100Hz]				
Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1. Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1. Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG. Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs. Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.1.1-1. Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].												

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

7.5.5.2 NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Editor's note:

- Message contents are not complete.
- Connection diagram is TBD.
- Test requirements are between brackets.

- Some parameters are TBD

7.5.5.2.1 Test purpose

The purpose of this test is:

To verify that the UE properly detects SSB-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candicate set q_1.

To test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used.

To partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

7.5.5.2.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

7.5.5.2.3 Minimum conformance requirements

[TS 38.133 [6], clause 8.5.2.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured SSB resource in set $\overline{q}_0$ estimated over the last $T_{Evaluate\_BFD\_SSB}$ [ms] period becomes worse than the threshold $Q_{out\_LR\_SSB}$ within $T_{Evaluate\_BFD\_SSB}$ [ms] period.

The value of $T_{Evaluate\_BFD\_SSB}$ is defined in Table 7.5.5.2.3-1 with N=8

For FR2,

- $P=1/(1 – T_{SSB}/T_{SMTCperiod})$, when BFD-RS is not overlapped with measurement gap and BFD-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$).
- P is $P_{sharing\ factor}$, when BFD-RS is not overlapped with measurement gap and BFD-RS is fully overlapped with SMTC period ($T_{SSB} = T_{SMTCperiod}$).
- P is $1/(1- T_{SSB}/MGRP - T_{SSB}/T_{SMTCperiod})$, when BFD-RS is partially overlapped with measurement gap and BFD-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$ or
  - $T_{SMTCperiod} = MGRP$ and $T_{SSB} < 0.5*T_{SMTCperiod}$
- P is $1/(1- T_{SSB} /MGRP)* P_{sharing\ factor}$, when BFD-RS is partially overlapped with measurement gap and BFD-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod} = MGRP$ and $T_{SSB} = 0.5*T_{SMTCperiod}$
- P is $1/\{1- T_{SSB} /\min (T_{SMTCperiod} ,MGRP)\}$, when BFD-RS is partially overlapped with measurement gap (T_{SSB} <MGRP) and BFD-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.
- P is $1/(1- T_{SSB} /MGRP)* P_{sharing\ factor}$, when BFD-RS is partially overlapped with measurement gap and BFD-RS is fully overlapped with SMTC occasion ($T_{SSB} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)
- $P_{sharing\ factor} = 3$.

If the high layer in TS 38.331 [13] signaling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

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

Table 7.5.5.2.3-1: Evaluation period $T_{Evaluate\_BFD\_out}$ for FR2

Configuration	$T_{Evaluate\_BFD\_SSB}$ (ms)
no DRX	max([50], ceil(5*P*N)*T_{SSB})
DRX cycle ≤ 320ms	max([50], ceil(7.5*P*N)*max(T_{DRX},T_{SSB}))
DRX cycle > 320ms	ceil(5*P*N)*T_{DRX}
Note: T_{SSB} is the periodicity of SSB in the set $\overline{q}_0$. T_{DRX} is the DRX cycle length.	

[TS 38.133 [6], clause 8.5.4]

When the radio link quality on all the configured RS resources in set $\overline{q}_0$ is worse than Q_{out_LR}, Layer 1 of the UE shall send a beam failure instance indication to the higher layers. A Layer 3 filter may be applied to the beam failure instance indications as specified in TS 38.331 [13].

The beam failure instance evaluation for the configured RS resources in set $\overline{q}_0$ shall be performed as specified in section 6 in TS 38.213 [8]. Two successive indications from Layer 1 shall be separated by at least $T_{Indication\_interval\_BFD}$.

When DRX is not used, $T_{Indication\_interval\_BFD}$ is max(2ms, $T_{BFD-RS,M}$), where $T_{BFD-RS,M}$ is the shortest periodicity of all configured RS resources in set $\overline{q}_0$ for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set $\overline{q}_0$ or CSI-RS resource in the set $\overline{q}_0$.

When DRX is used, $T_{Indication\_interval\_BFD}$ is max(1.5*DRX_cycle_length, 1.5*$T_{BFD-RS,M}$) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication\_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms.[TS 38.133 [6], clause 8.5.5.2]

UE shall be able to evaluate whether the L1-RSRP measured on the configured SSB resource in set $\overline{q}_1$ estimated over the last $T_{Evaluate\_CBD\_SSB}$ [ms] period becomes better than the threshold Q_{in_LR}.

The value of $T_{Evaluate\_CBD\_SSB}$ is defined in Table 7.5.5.2.3-2 for FR2 with N=8.

For FR2,

- P=1/(1 – T_{SSB}/$T_{SMTCperiod}$), when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$).
- P is 3, when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC period ($T_{SSB} = T_{SMTCperiod}$).
- P is 1/(1- T_{SSB}/MGRP - T_{SSB}/$T_{SMTCperiod}$), when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion (T_{SSB} < $T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
    - $T_{SMTCperiod} \neq$ MGRP or
    - $T_{SMTCperiod}$ = MGRP and $T_{SSB} < 0.5*T_{SMTCperiod}$
- P is 1/(1- T_{SSB} /MGRP)*3, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{SSB} = 0.5*T_{SMTCperiod}$
- P is 1/{1- T_{SSB} /min ($T_{SMTCperiod}$,MGRP)}, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion (T_{SSB} < $T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap
- P is 1/(1- T_{SSB} /MGRP)*3, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion ($T_{SSB} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)

[Longer evaluation period would be expected if the SSB is on the same OFDM symbols with RLM/BFD/BM-RS, or other CBD-RS, according to the measurement restrictions defined in section TBD.]

Table 7.5.5.2.3-2: Evaluation period $T_{Evaluate\_CBD\_out}$ for FR2

Configuration	$T_{Evaluate\_CBD\_SSB}$ (ms)
non-DRX	ceil([3]*P*N) * T_{SSB}
DRX cycle ≤ 320ms	ceil([3]*P*N*1.5) * max(T_{DRX},T_{SSB})
DRX cycle > 320ms	ceil([3]*P*N) * T_{DRX}
Note: T_{SSB} is the periodicity of SSB in the set $\overline{q}_1$. T_{DRX} is the DRX cycle length.	

The normative reference for this requirement is TS 38.133 [6] clauses 8.5.2.2, 8.5.4, 8.5.5.2 and A.7.5.5.1.

7.5.5.2.4 Test description

The test consists of two subtests with one NR serving cell configured. The difference between the two subtests is whether the measurement gap is configured on the NR serving Cell or not. Each subtest consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.2.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate SSB based beam failure.

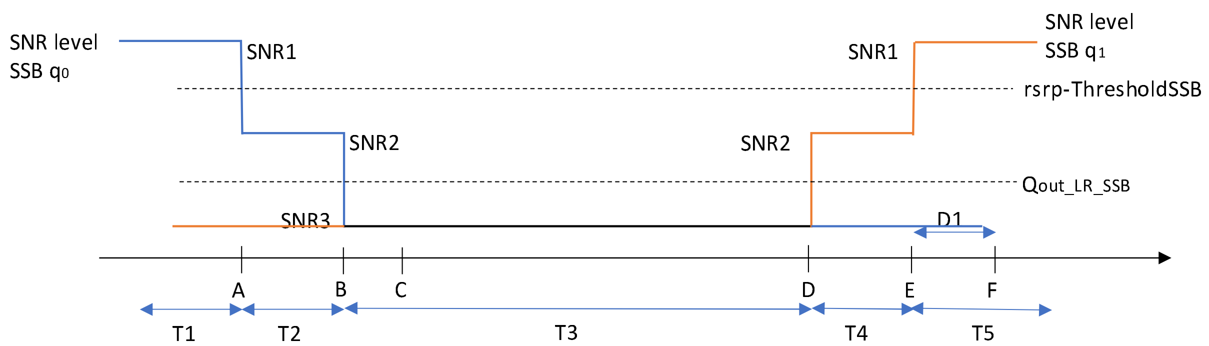


Figure 7.5.5.2.4-1: SNR variation SSB for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

7.5.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.2.4.1-1.

Table 7.5.5.2.4.1-1: Supported test configurations for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Configuration	Description
1	TDD duplex mode, 120 kHz SSB SCS, 100MHz bandwidth
2	TDD duplex mode, 240 kHz SSB SCS, 100MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR2	

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.2.4.1-2.

Table 7.5.5.2.4.1-2: Initial conditions for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.5.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.5.2.4.1-3. The measurement gap configuration for sub-test 2 is according to Table 7.5.5.2.4.1-4. The DRX configuration for subtest 1 and 2 is according to Table 7.5.5.2.4.1-5. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

2. Message contents are defined in clause 7.5.5.2.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.2.4.1-3: General test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Parameter		Unit	Value		Comment
			Test 1	Test 2	
Active PCell			Cell 1	Cell 1	
RF Channel Number			1	1	
Duplex mode	Config 1		TDD	TDD	
	Config 2		TDD	TDD	
TDD Configuration	Config 1		[TDDConf.3.1]	[TDDConf.3.1]	
	Config 2		[TDDConf.3.1]	[TDDConf.3.1]	
CORESET Reference Channel	Config 1		[CR. 3.1 TDD]	[CR. 3.1 TDD]	
	Config 2		[CR. 3.1 TDD]	[CR. 3.1 TDD]	
SSB Configuration	Config 1		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)	
	Config 2		TBD (Note: periodicity is 20ms)	TBD (Note: periodicity is 20ms)	
SMTC Configuration	Config 1		TDD	TDD	
	Config 2		TDD	TDD	
PDSCH/ PDCCH subcarrier spacing	Config 1		120 KHz	120 KHz	
	Config 2		120 KHz	120 KHz	
csi-RS-Index assigned as RLM RS			[0]	[0]	
OCNG parameters			TBD	TBD	
CP length			Normal	Normal	
Correlation Matrix and Antenna Configuration			[2x2 Low]	[2x2 Low]	
Beam failure detection transmission parameters	DCI format		1-0	1-0	
	Number of Control OFDM symbols		2	2	
	Aggregation level	CCE	8	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	0	
	DMRS precoder granularity		REG bundle size	REG bundle size	
	REG bundle size		6	6	
DRX			640	640	
Gap pattern ID			[N.A.]	*[*gp0*]	
ssb-Index			2	2	Number of SSB indexes used for beam failure detection

rlmInSyncOutOfSync Threshold			absent	absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).
rsrp-ThresholdSSB			TBD	TBD	Threshold used for $Q_{out\_LR\_SSB}$
powerControlOffsetSS			NA	NA	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstance MaxCount			[n2]	[n2]	see TS 38.321 [7], section 5.17
beamFailureDetection Timer			[pbfd4]	[pbfd4]	see TS 38.321 [7], section 5.17
ZP CSI-RS configuation			TBD	TBD	
CSI-IM configuration			TBD	TBD	
Periodic CSI reporting			PUCCH	PUCCH	
CSI reporting periodicity	Config 1, 2	slot	[5]	[5]	
	Config 3		[10]	[10]	
T1		s	1	1	During this time the UE shall be fully synchronized to cell 1
T2		s	0.4	0.4	
T3		s	[0.6]	[0.6]	
D1		s	[0.24]	[0.44]	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.					

Table 7.5.5.2.4.1-4: Measurement gap configuration for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Field	Test 2
	Value
gapOffset	[0]

Table 7.5.5.2.4.1-5: DRX-Configuration for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Field	Test 5	Test 6
	Value	Value
drx-onDurationTimer	[ms6]	[ms6]
drx-InactivityTimer	[ms1]	[ms1]
drx-RetransmissionTimerDL	[sl1]	[sl1]
drx-RetransmissionTimerUL	[sl1]	[sl1]
longDRX-CycleStartOffset	[ms640]	[ms40]
shortDRX	disable	disable

7.5.5.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in subtest 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.2.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.2.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.2.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.2.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.2.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect any uplink power on NR carrier higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C until T3 expires

   and

   c) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point F (D1 after the start of T5) until T5 expires,

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.2.5-1.

9. Wait [1s] for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within [1s] continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

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

7.5.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.5.5.2.4.3-1: Common Exception messages for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	TBD

7.5.5.2.5 Test requirement

Tables 7.5.5.2.4.1-3 and 7.5.5.2.5-1 define the primary level settings including test tolerances for NR SA FR2 SSB-based beam failure detection and link recovery in DRX.

Table 7.5.5.2.5-1: NR Cell specific test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Parameter		Unit	Test 1 and Test 2					Test 1 and Test 2				
			SSB of set q_0					SSB of set q_1				
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
PDCCH_beta		dB	4					4				
PDCCH_DMRS_beta		dB	4					4				
PBCH_beta		dB	0					0				
PSS_beta		dB										
SSS_beta		dB										
PDSCH_beta		dB										
OCNG_beta		dB										
SNR	Config 1	dB	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Config 2		TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Config 3		TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N_{oc}	Config 1	dBm/15K Hz	[-98]					[-98]				
	Config 2		[-98]					[-98]				
	Config 3		[-98]					[-98]				
Propagation condition			[TDL-C 300ns 100Hz]					[TDL-C 300ns 100Hz]				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.2.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

7.5.5.3 NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- Test requirements are between brackets.

- Some parameters are TBD

7.5.5.3.1 Test purpose

The purpose of this test is:

To verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set q_1.

To test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used.

To partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

7.5.5.3.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

7.5.5.3.3 Minimum conformance requirements

[TS 38.133 [6], clause 8.5.3.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured CSI-RS resource in set $\overline{q}_0$ estimated over the last $T_{Evaluate\_BFD\_CSI-RS}$ [ms] period becomes worse than the threshold $Q_{out\_LR\_CSI-RS}$ within $T_{Evaluate\_BFD\_CSI-RS}$ [ms] period.

The value of $T_{Evaluate\_BFD\_CSI-RS}$ is defined in Table 7.5.5.3.3-1 with

- N=1,
- the CSI-RS for BFD is QCL-TypeD with SSB for L1-RSRP beam reporting, and the CSI-RS for BFD and SSB for L1-RSRP beam reporting are TDM'd, and the CSI-RS for BFD is not in a resource set configured with repetition ON.

  Or

- the CSI-RS for BFD is QCL-TypeD with CSI-RS for L1-RSRP beam reporting with repetition parameter ON, and the CSI-RS for BFD and CSI-RS for L1-RSRP beam reporting are TDM'd, and the CSI-RS for BFD is not in a resource set configured with repetition ON.

  Editor's Note: It is FFS if N=1 can apply if the QCL-ed CSI-RS for L1-RSRP beam reporting is configured with repetition parameter "OFF".

- N=8, otherwise.

For FR2,

- P=1, when BFD-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P=1/(1 – T_{CSI-RS}/MGRP)$, when BFD-RS is partially overlapped with measurement gap and BFD-RS is not overlapped with SMTC occasion ($T_{CSI-RS} < MGRP$)
- $P=1/(1 – T_{CSI-RS} /T_{SMTCperiod})$, when BFD-RS is not overlapped with measurement gap and BFD-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).
- P is $P_{sharing\ factor}$, when BFD-RS is not overlapped with measurement gap and BFD-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).
- P is $1/(1- T_{CSI-RS} /MGRP - T_{CSI-RS} /T_{SMTCperiod})$, when BFD-RS is partially overlapped with measurement gap and BFD-RS is partially overlapped with SMTC occasion (TCSI-RS < $T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$ or

  - $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} < 0.5*T_{SMTCperiod}$

- P is 1/(1- T_{CSI-RS} /MGRP)* $P_{sharing\ factor}$, when BFD-RS is partially overlapped with measurement gap and BFD-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} = 0.5*T_{SMTCperiod}$

- P is 1/{1- T_{CSI-RS} /min ($T_{SMTCperiod}$,MGRP)}, when BFD-RS is partially overlapped with measurement gap (T_{CSI-RS} < MGRP) and BFD-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.

- P is 1/(1- T_{CSI-RS} /MGRP)* $P_{sharing\ factor}$, when BFD-RS is partially overlapped with measurement gap and BFD-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)

- $P_{sharing\ factor}$ is 3**.**

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

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

The values of M_{BFD} used in Table 7.5.5.3.3-1 are defined as

- M_{BFD} = 10, if the CSI-RS resource configured for BFD is transmitted with Density = 3.

Table 7.5.5.3.3-1: Evaluation period $T_{Evaluate\_BFD\_CSI-RS}$ for FR2

Configuration	$T_{Evaluate\_BFD\_CSI-RS}$ (ms)
no DRX	max([50], [M_{BFD} *P*N] * T_{CSI-RS})
DRX cycle ≤ 320ms	max([50], [1.5×M_{BFD}*P*N]*max(T_{DRX}, T_{CSI-RS}))
DRX cycle > 320ms	[M_{BFD} *P*N] * T_{DRX}
Note: T_{CSI-RS} is the periodicity of CSI-RS resource in the set $\overline{q}_0$. T_{DRX} is the DRX cycle length.	

[TS 38.133 [6], clause 8.5.4]

When the radio link quality on all the configured RS resources in set $\overline{q}_0$ is worse than Q_{out_LR}, Layer 1 of the UE shall send a beam failure instance indication to the higher layers. A Layer 3 filter may be applied to the beam failure instance indications as specified in TS 38.331 [13].

The beam failure instance evaluation for the configured RS resources in set $\overline{q}_0$ shall be performed as specified in section 6 in TS 38.213 [8]. Two successive indications from Layer 1 shall be separated by at least $T_{Indication\_interval\_BFD}$.

When DRX is not used, $T_{Indication\_interval\_BFD}$ is max(2ms, $T_{BFD-RS,M}$), where $T_{BFD-RS,M}$ is the shortest periodicity of all configured RS resources in set $\overline{q}_0$ for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set $\overline{q}_0$ or CSI-RS resource in the set $\overline{q}_0$.

When DRX is used, $T_{Indication\_interval\_BFD}$ is max(1.5*DRX_cycle_length, 1.5*$T_{BFD-RS,M}$) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication\_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms.[TS 38.133 [6], clause 8.5.6.2]

UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in set $\overline{q}_1$ estimated over the last $T_{Evaluate\_CBD\_CSI-RS}$ [ms] period becomes better than the threshold Q_{in_LR} within $T_{Evaluate\_CBD\_CSI-RS}$ [ms] period.

The value of $T_{Evaluate\_CBD\_CSI-RS}$ is defined in Table 7.5.5.3.3-2 for FR2 with N=8.

Editor's Note: FFS whether N=1 need to be applied for CSI-RS based candidate beam detection in FR2.

For FR2,

- P=1, when candidate beam detection RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P=1/(1 - T_{CSI-RS}/MGRP)$, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is not overlapped with SMTC occasion ($T_{CSI-RS} < MGRP$)
- $P=1/(1 - T_{CSI-RS} /T_{SMTCperiod})$, when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).
- P is 3, when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).
- P is $1/(1- T_{CSI-RS} /MGRP - T_{CSI-RS} /T_{SMTCperiod})$, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion (TCSI-RS < $T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$ or
  - $T_{SMTCperiod} = MGRP$ and $T_{CSI-RS} < 0.5*T_{SMTCperiod}$
- P is $1/(1- T_{CSI-RS} /MGRP)* 3$, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod} = MGRP$ and $T_{CSI-RS} = 0.5*T_{SMTCperiod}$
- P is $1/\{1- T_{CSI-RS} /\min (T_{SMTCperiod} ,MGRP)\}$, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap
- P is $1/(1- T_{CSI-RS} /MGRP)* 3$, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod} < MGRP$) [Longer evaluation period would be expected if the CSI-RS is on the same OFDM symbols with RLM/BFD/BM-RS, or other CBD-RS, according to the measurement restrictions defined in section TBD.]

The values of M_{CBD} used in Table 7.5.5.3.3-2 is defined as

- $M_{CBD} = 3$, if the CSI-RS resource configured in the set $\overline{q}_1$ is transmitted with Density = 3.

Table 7.5.5.3.3-2: Evaluation period $T_{Evaluate\_CBD\_CSI-RS}$ for FR2

Configuration	$T_{Evaluate\_CBD\_CSI-RS}$ (ms)
non-DRX	$\max(TBD, ceil(M_{CBD} *P*N) * T_{CSI-RS})$
DRX cycle ≤ 320ms	$ceil(M_{CBD} *P*N*1.5) * \max(T_{DRX}, T_{CSI-RS})$
DRX cycle > 320ms	$ceil(M_{CBD} *P*N) *T_{DRX}$
Note: T_{CSI-RS} is the periodicity of CSI-RS resource in the set $\overline{q}_1$. T_{DRX} is the DRX cycle length.	

The normative reference for this requirement is TS 38.133 [6] clauses 8.5.3.2, 8.5.4, 8.5.6.2 and A.6.5.5.3.

7.5.5.3.4 Test description

The test consists of two subtests with one NR serving cell configured. The difference between the two subtests is whether the measurement gap is configured on the NR serving Cell or not. Each subtest consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.3.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate CSI-RS based beam failure.

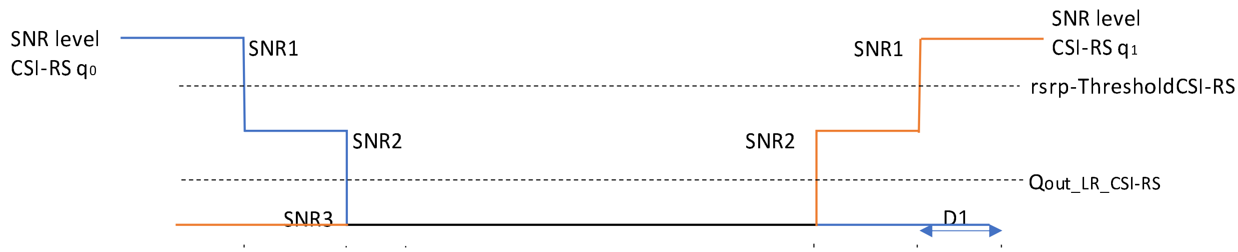


Figure 7.5.5.3.4-1: SNR variation CSI-RS for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

7.5.5.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.3.4.1-1.

Table 7.5.5.3.4.1-1: Supported test configurations for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Configuration	Description
1	TDD duplex mode, 120 kHz SSB SCS, 100MHz bandwidth

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.3.4.1-2.

Table 7.5.5.3.4.1-2: Initial conditions for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.5.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.5.3.4.1-3. The measurement gap configuration for sub-test 2 is according to Table 7.5.5.3.4.1-4. The NZP-CSI-RS configuration for sub-test 1 and 2 is according to Table 7.5.5.3.4.1-5.

2. Message contents are defined in clause 7.5.5.3.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.3.4.1-3: General test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Parameter		Unit	Value Test 1	Value Test 2	Comment
Active PCell			Cell 1	Cell 1	
RF Channel Number			1	1	
Duplex mode	Config 1		TDD	TDD	
TDD Configuration	Config 1		[TDDConf.3.1]	[TDDConf.3.1]	
CORESET Reference Channel	Config 1		[CR. 3.1 TDD]	[CR. 3.1 TDD]	A.3.1.2
SSB Configuration	Config 1		SSB.1 FR2	SSB.1 FR2	A.3.10
SMTC Configuration	Config 1		SMTC.1	SMTC.1	A.3.11
PDSCH/PDCCH subcarrier spacing	Config 1		120KHz	120KHz	
csi-RS-Index assigned as beam failure RS			[0]	[0]	
OCNG parameters			TBD	TBD	A.3.2.1
CP length			Normal	Normal	
Correlation Matrix and Antenna Configuration			[2x2 Low]	[2x2 Low]	
Beam failure detection transmission parameters	DCI format		1-0	1-0	
	Number of Control OFDM symbols		2	2	
	Aggregation level	CCE	8	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	0	
	DMRS precoder granularity		REG bundle size	REG bundle size	
	REG bundle size		6	6	
DRX			OFF	OFF	
Gap pattern ID			[N.A.]	*[*gp0*]	

csi-RS-Index			2	2	Number of SSB indexes used for beam failure detection
rlmInSyncOutOfSync Threshold			absent	absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).
rsrp-ThresholdSSB			TBD	TBD	Threshold used for $Q_{out\_LR\_SSB}$
powerControlOffsetSS			NA	NA	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstance MaxCount			[n2]	[n2]	see TS 38.321 [7], section 5.17
beamFailureDetection Timer			[pbfd4]	[pbfd4]	see TS 38.321 [7], section 5.17
ZP CSI-RS configuation			TBD	TBD	
CSI-IM configuration			TBD	TBD	
Periodic CSI reporting			PUCCH	PUCCH	
CSI reporting periodicity	Config 1, 2	slot	[5]	[5]	
	Config 3		[10]	[10]	
T1		s	1	1	During this time the UE shall be fully synchronized to cell 1
T2		s	0.4	0.4	
T3		s	[TBD]	[TBD]	
D1		s	[0.24]	[0.44]	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.					

Table 7.5.5.3.4.1-4: Measurement gap configuration for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Field	Test 2
	Value
gapOffset	[0]

Table 7.5.5.3.4.1-5: NZP-CSI-RS resource configuration for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Field	ResourceId 0	ResourceId 1
	Value	Value
frequencyDomainAllocation Note 1	row1	row2
startingRB	0	0
nrofRBs	Note 2	Note 2
Note 1: TS 38.211 [6] table 7.4.1.5.3-1 Note 2: nrofRBs is derived based on the Configuration in TS 38.133 [6] Table A.4.5.1.7.1-1		

7.5.5.3.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in subtest 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.3.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.3.5-1. T2 starts.
4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.3.5-1. T3 starts.
5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.3.5-1. T4 starts.
6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.3.5-1. T5 starts.
7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect any uplink power on NR carrier higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C until T3 expires

   and

   c) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point F (D1 after the start of T5) until T5 expires,

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.3.5-1.
9. Wait [1s] for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within [1s] continue to step 11. Otherwise continue to step 10.
10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.
11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.5.5.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.5.5.3.4.3-1: Common Exception messages for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	TBD

7.5.5.3.5 Test requirement

Tables 7.5.5.3.4.1-3 and 7.5.5.3.5-1 define the primary level settings including test tolerances for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX.

Table 7.5.5.3.5-1: NR Cell specific test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Parameter		Unit	Test 1 and Test 2					Test 1 and Test 2				
			CSI-RS of set q_0					CSI-RS of set q_1				
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
EPRE ratio of PSS to SSS		dB										
EPRE ratio of PBCH DMRS to SSS		dB										
EPRE ratio of PBCH to PBCH DMRS		dB										
EPRE ratio of PDCCH DMRS to SSS		dB										
EPRE ratio of PDCCH to PDCCH DMRS		dB			0					0		
EPRE ratio of PDSCH DMRS to SSS		dB										
EPRE ratio of PDSCH to PDSCH DMRS		dB										
EPRE ratio of OCNG DMRS to SSS(Note 1)		dB										
EPRE ratio of OCNG to OCNG DMRS (Note 1)		dB										
SNR_CSI-RS	Config 1	dB	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Config 2		TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Config 3		TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N_{oc}	Config 1	dBm/15KHz			[-98]					[-98]		
	Config 2				[-98]					[-98]		
	Config 3				[-98]					[-98]		
SS-RSRP Note 3		dBm/SCS										
$\hat{E}_s/I_{ot}$												
$\hat{E}_s/N_{oc}$												
Io	config 1, 2	dBm/9.36 MHz										
	Config 3, 4	dBm/38.1 MHz										
Propagation condition					[TDLA30-75]					[TDLA30-75]		
Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.												

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

7.5.5.4 NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Editor's note:

- Message contents are not complete.

- Connection diagram is TBD.

- Test requirements are between brackets.

- Some parameters are TBD

7.5.5.4.1 Test purpose

The purpose of this test is:

To verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set q_1.

To test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used.

To partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

7.5.5.4.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

7.5.5.4.3 Minimum conformance requirements

[TS 38.133 [6], clause 8.5.3.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured CSI-RS resource in set $\overline{q}_0$ estimated over the last $T_{Evaluate\_BFD\_CSI-RS}$ [ms] period becomes worse than the threshold $Q_{out\_LR\_CSI-RS}$ within $T_{Evaluate\_BFD\_CSI-RS}$ [ms] period.

The value of $T_{Evaluate\_BFD\_CSI-RS}$ is defined in Table 7.5.5.4.3-1 with

- N=1,
- the CSI-RS for BFD is QCL-TypeD with SSB for L1-RSRP beam reporting, and the CSI-RS for BFD and SSB for L1-RSRP beam reporting are TDM'd, and the CSI-RS for BFD is not in a resource set configured with repetition ON.

  Or
- the CSI-RS for BFD is QCL-TypeD with CSI-RS for L1-RSRP beam reporting with repetition parameter ON, and the CSI-RS for BFD and CSI-RS for L1-RSRP beam reporting are TDM'd, and the CSI-RS for BFD is not in a resource set configured with repetition ON.

  Editor's Note: It is FFS if N=1 can apply if the QCL-ed CSI-RS for L1-RSRP beam reporting is configured with repetition parameter "OFF".
- N=8, otherwise.

For FR2,

- P=1, when BFD-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- P=1/(1 – T_{CSI-RS}/MGRP) , when BFD-RS is partially overlapped with measurement gap and BFD-RS is not overlapped with SMTC occasion (T_{CSI-RS} < MGRP)
- P=1/(1 – T_{CSI-RS} /$T_{SMTCperiod}$), when BFD-RS is not overlapped with measurement gap and BFD-RS is partially overlapped with SMTC occasion (T_{CSI-RS} < $T_{SMTCperiod}$).
- P is $P_{sharing\ factor}$, when BFD-RS is not overlapped with measurement gap and BFD-RS is fully overlapped with SMTC occasion (T_{CSI-RS} = $T_{SMTCperiod}$).
- P is 1/(1- T_{CSI-RS} /MGRP - T_{CSI-RS} /$T_{SMTCperiod}$), when BFD-RS is partially overlapped with measurement gap and BFD-RS is partially overlapped with SMTC occasion (TCSI-RS < $T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod}$ ≠ MGRP or
  - $T_{SMTCperiod}$ = MGRP and T_{CSI-RS} < 0.5*$T_{SMTCperiod}$
- P is 1/(1- T_{CSI-RS} /MGRP)* $P_{sharing\ factor}$, when BFD-RS is partially overlapped with measurement gap and BFD-RS is partially overlapped with SMTC occasion (T_{CSI-RS} < $T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and T_{CSI-RS} = 0.5*$T_{SMTCperiod}$
- P is 1/{1- T_{CSI-RS} /min ($T_{SMTCperiod}$,MGRP)}, when BFD-RS is partially overlapped with measurement gap (T_{CSI-RS} < MGRP) and BFD-RS is partially overlapped with SMTC occasion (T_{CSI-RS} < $T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.
- P is 1/(1- T_{CSI-RS} /MGRP)* $P_{sharing\ factor}$, when BFD-RS is partially overlapped with measurement gap and BFD-RS is fully overlapped with SMTC occasion (T_{CSI-RS} = $T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)
- $P_{sharing\ factor}$ is 3**.**

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

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

The values of M_{BFD} used in Table 7.5.5.4.3-1 are defined as

- M_{BFD} = 10, if the CSI-RS resource configured for BFD is transmitted with Density = 3.

Table 7.5.5.4.3-1: Evaluation period $T_{Evaluate\_BFD\_CSI-RS}$ for FR2

Configuration	$T_{Evaluate\_BFD\_CSI-RS}$ (ms)
no DRX	max([50], [M_{BFD} *P*N] * T_{CSI-RS})
DRX cycle ≤ 320ms	max([50], [1.5×M_{BFD}*P*N]*max(T_{DRX}, T_{CSI-RS}))
DRX cycle > 320ms	[M_{BFD} *P*N] * T_{DRX}
Note: T_{CSI-RS} is the periodicity of CSI-RS resource in the set $\overline{q}_0$. T_{DRX} is the DRX cycle length.	

[TS 38.133 [6], clause 8.5.4]

When the radio link quality on all the configured RS resources in set $\overline{q}_0$ is worse than Q_{out_LR}, Layer 1 of the UE shall send a beam failure instance indication to the higher layers. A Layer 3 filter may be applied to the beam failure instance indications as specified in TS 38.331 [13].

The beam failure instance evaluation for the configured RS resources in set $\overline{q}_0$ shall be performed as specified in section 6 in TS 38.213 [8]. Two successive indications from Layer 1 shall be separated by at least $T_{Indication\_interval\_BFD}$.

When DRX is not used, $T_{Indication\_interval\_BFD}$ is max(2ms, $T_{BFD-RS,M}$), where $T_{BFD-RS,M}$ is the shortest periodicity of all configured RS resources in set $\overline{q}_0$ for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set $\overline{q}_0$ or CSI-RS resource in the set $\overline{q}_0$.

When DRX is used, $T_{Indication\_interval\_BFD}$ is max(1.5*DRX_cycle_length, 1.5*$T_{BFD-RS,M}$) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication\_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms.[TS 38.133 [6], clause 8.5.6.2]

UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in set $\overline{q}_1$ estimated over the last $T_{Evaluate\_CBD\_CSI-RS}$ [ms] period becomes better than the threshold Q_{in_LR} within $T_{Evaluate\_CBD\_CSI-RS}$ [ms] period.

The value of $T_{Evaluate\_CBD\_CSI-RS}$ is defined in Table 7.5.5.4.3-2 for FR2 with N=8.

Editor's Note: FFS whether N=1 need to be applied for CSI-RS based candidate beam detection in FR2.

For FR2,

- P=1, when candidate beam detection RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- P=1/(1 – T_{CSI-RS}/MGRP) , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is not overlapped with SMTC occasion (T_{CSI-RS} < MGRP)
- P=1/(1 – T_{CSI-RS} /$T_{SMTCperiod}$), when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion (T_{CSI-RS} < $T_{SMTCperiod}$).
- P is 3, when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion (T_{CSI-RS} = $T_{SMTCperiod}$).
- P is 1/(1- T_{CSI-RS} /MGRP - T_{CSI-RS} /$T_{SMTCperiod}$), when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion (TCSI-RS < $T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq$ MGRP or
  - $T_{SMTCperiod}$ = MGRP and T_{CSI-RS} < 0.5*$T_{SMTCperiod}$
- P is 1/(1- T_{CSI-RS} /MGRP)* 3, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion (T_{CSI-RS} < $T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and T_{CSI-RS} = 0.5*$T_{SMTCperiod}$
- P is 1/{1- T_{CSI-RS} /min ($T_{SMTCperiod}$,MGRP)}, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion (T_{CSI-RS} < $T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap
- P is 1/(1- T_{CSI-RS} /MGRP)* 3, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion (T_{CSI-RS} = $T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP) [Longer evaluation period would be expected if the CSI-RS is on the same OFDM symbols with RLM/BFD/BM-RS, or other CBD-RS, according to the measurement restrictions defined in section TBD.]

The values of M_{CBD} used in Table 7.5.5.4.3-2 is defined as

- M_{CBD} = 3, if the CSI-RS resource configured in the set $\overline{q}_1$ is transmitted with Density = 3.

Table 7.5.5.4.3-2: Evaluation period $T_{Evaluate\_CBD\_CSI-RS}$ for FR2

Configuration	$T_{Evaluate\_CBD\_CSI-RS}$ (ms)
non-DRX	max(TBD, ceil(M_{CBD} *P*N) * T_{CSI-RS})
DRX cycle ≤ 320ms	ceil(M_{CBD} *P*N*1.5) * max(T_{DRX}, T_{CSI-RS})
DRX cycle > 320ms	ceil(M_{CBD} *P*N) *T_{DRX}
Note: T_{CSI-RS} is the periodicity of CSI-RS resource in the set $\overline{q}_1$. T_{DRX} is the DRX cycle length.	

The normative reference for this requirement is TS 38.133 [6] clauses 8.5.3.2, 8.5.4, 8.5.6.2 and A.6.5.5.3.

7.5.5.4.4 Test description

The test consists of two subtests with one NR serving cell configured. The difference between the two subtests is whether the measurement gap is configured on the NR serving Cell or not. Each subtest consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.4.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate CSI-RS based beam failure.

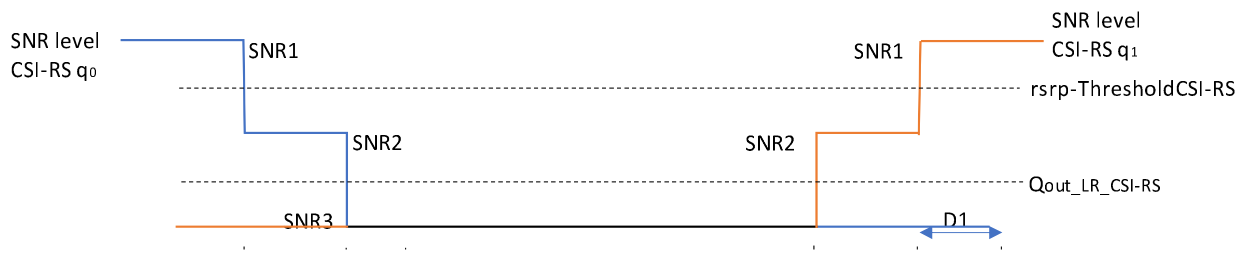


Figure 7.5.5.4.4-1: SNR variation CSI-RS for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

7.5.5.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.4.4.1-1.

Table 7.5.5.4.4.1-1: Supported test configurations for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Configuration	Description
1	TDD duplex mode, 120 kHz SSB SCS, 100MHz bandwidth

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.4.4.1-2.

Table 7.5.5.4.4.1-2: Initial conditions for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.5.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.5.4.4.1-3. The measurement gap configuration for sub-test 2 is according to Table 7.5.5.4.4.1-4. The NZP-CSI-RS configuration for sub-test 1 and 2 is according to Table 7.5.5.4.4.1-5. The DRX configuration for subtest 1 and 2 is according to Table 7.5.5.4.4.1-6. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

2. Message contents are defined in clause 7.5.5.4.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.4.4.1-3: General test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Parameter		**Unit**	**Value**		**Comment**
			Test 1	**Test 2**	
Active PCell			Cell 1	Cell 1	
RF Channel Number			1	1	
Duplex mode	Config 1		TDD	TDD	
TDD Configuration	Config 1		[TDDConf.3.1]	[TDDConf.3.1]	
CORESET Reference Channel	Config 1		[CR. 3.1 TDD]	[CR. 3.1 TDD]	A.3.1.2
SSB Configuration	Config 1		SSB.1 FR2	SSB.1 FR2	A.3.10
SMTC Configuration	Config 1		SMTC.1	SMTC.1	A.3.11
PDSCH/PDCCH subcarrier spacing	Config 1		120 KHz	120 KHz	
csi-RS-Index assigned as RLM RS			[0]	[0]	
OCNG parameters			TBD	TBD	A.3.2.1
CP length			Normal	Normal	
Correlation Matrix and Antenna Configuration			[2x2 Low]	[2x2 Low]	
Beam failure detection trans mission parameters	DCI format		1-0	1-0	
	Number of Control OFDM symbols		2	2	
	Aggregation level	CCE	8	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	0	
	DMRS precoder granularity		REG bundle size	REG bundle size	
	REG bundle size		6	6	
DRX			640	640	
Gap pattern ID			[N.A.]	*[*gp0*]	
csi-RS-Index			2	2	Number of SSB indexes used for beam failure detection

rlmInSyncOutOfSync Threshold			absent	absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).
rsrp-ThresholdSSB			TBD	TBD	Threshold used for $Q_{out\_LR\_SSB}$
powerControlOffsetSS			NA	NA	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstance MaxCount			[n2]	[n2]	see TS 38.321 [7], section 5.17
beamFailureDetection Timer			[pbfd4]	[pbfd4]	see TS 38.321 [7], section 5.17
ZP CSI-RS configuation			TBD	TBD	
CSI-IM configuration			TBD	TBD	
Periodic CSI reporting			PUCCH	PUCCH	
CSI reporting periodicity	Config 1, 2	slot	[5]	[5]	
	Config 3		[10]	[10]	
T1		s	1	1	During this time the UE shall be fully synchronized to cell 1
T2		s	0.4	0.4	
T3		s	[TBD]	[TBD]	
D1		s	[0.24]	[0.44]	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.					

Table 7.5.5.4.4.1-4: Measurement gap configuration for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Field	Test 2
	Value
gapOffset	[0]

Table 7.5.5.4.4.1-5: NZP-CSI-RS resource configuration for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Field	ResourceId 0	ResourceId 1
	Value	Value
frequencyDomainAllocation Note 1	row1	row2
startingRB	0	0
nrofRBs	Note 2	Note 2
Note 1: TS 38.211 [6] table 7.4.1.5.3-1 Note 2: nrofRBs is derived based on the Configuration in TS 38.133 [6] Table A.4.5.1.7.1-1		

Table 7.5.5.4.4.1-6: DRX-Configuration for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Field	Test 5	Test 6
	Value	Value
drx-onDurationTimer	[ms6]	[ms6]
drx-InactivityTimer	[ms1]	[ms1]
drx-RetransmissionTimerDL	[sl1]	[sl1]
drx-RetransmissionTimerUL	[sl1]	[sl1]
longDRX-CycleStartOffset	[ms640]	[ms40]
shortDRX	disable	disable

7.5.5.4.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in subtest 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.4.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.4.5-1. T2 starts.
4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.4.5-1. T3 starts.
5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.4.5-1. T4 starts.
6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.4.5-1. T5 starts.
7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect any uplink power on NR carrier higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C until T3 expires

   and

   c) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point F (D1 after the start of T5) until T5 expires,

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.4.5-1.
9. Wait [1s] for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within [1s] continue to step 11. Otherwise continue to step 10.
10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

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

7.5.5.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.5.5.4.4.3-1: Common Exception messages for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	TBD

7.5.5.4.5 Test requirement

Tables 7.5.5.4.4.1-3 and 7.5.5.4.5-1 define the primary level settings including test tolerances for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX.

Table 7.5.5.4.5-1: NR Cell specific test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Parameter		Unit	Test 1 and Test 2					Test 1 and Test 2				
			CSI-RS of set q_0					CSI-RS of set q_1				
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
EPRE ratio of PSS to SSS		dB	0					0				
EPRE ratio of PBCH DMRS to SSS		dB										
EPRE ratio of PBCH to PBCH DMRS		dB										
EPRE ratio of PDCCH DMRS to SSS		dB										
EPRE ratio of PDCCH to PDCCH DMRS		dB										
EPRE ratio of PDSCH DMRS to SSS		dB										
EPRE ratio of PDSCH to PDSCH DMRS		dB										
EPRE ratio of OCNG DMRS to SSS(Note 1)		dB										
EPRE ratio of OCNG to OCNG DMRS (Note 1)		dB										
SNR_CSI-RS	Config 1	dB	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Config 2		TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Config 3		TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N_{oc}	Config 1	dBm/15KHz	[-98]					[-98]				
	Config 2		[-98]					[-98]				
	Config 3		[-98]					[-98]				
SS-RSRP Note 3		dBm/SCS										
$\hat{E}_s/I_{ot}$												
$\hat{E}_s/N_{oc}$												
Io	config 1, 2	dBm/9.36 MHz										
	Config 3, 4	dBm/38.1 MHz										
Propagation condition			[TDLA30-75]					[TDLA30-75]				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

7.5.6 Active BWP switch delay

7.5.6.1 DCI-based and time-based active BWP switch

7.5.6.1.0 Minimum conformance requirements

FFS

7.5.6.1.1 NR SA FR2 DCI-based DL active BWP switch in non-DRX

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

7.5.6.1.1.1 Test purpose

FFS

7.5.6.1.1.2 Test applicability

FFS

7.5.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.1.1.

7.5.6.1.1.4 Test description

7.5.6.1.1.4.1 Initial conditions

FFS

7.5.6.1.1.4.2 Test procedure

FFS

7.5.6.1.1.4.3 Message contents

FFS

7.5.6.1.1.5 Test requirements

FFS

7.5.6.1.2 NR SA FR1-FR2 DCI-based DL active BWP switch in non-DRX

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

7.5.6.1.2.1 Test purpose

FFS

7.5.6.1.2.2 Test applicability

FFS

7.5.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.1.2.

7.5.6.1.2.4 Test description

7.5.6.1.2.4.1 Initial conditions

FFS

7.5.6.1.2.4.2 Test procedure

FFS

7.5.6.1.2.4.3 Message contents

FFS

7.5.6.1.2.5 Test requirements

FFS

7.5.6.2 RRC-based active BWP switch

7.5.6.2.0 Minimum conformance requirements

FFS

7.5.6.2.1 NR SA FR2 RRC-based DL active BWP switch in non-DRX

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

7.5.6.2.1.1 Test purpose

FFS

7.5.6.2.1.2 Test applicability

FFS

7.5.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.2.1.

7.5.6.2.1.4 Test description

7.5.6.2.1.4.1 Initial conditions

FFS

7.5.6.2.1.4.2 Test procedure

FFS

7.5.6.2.1.4.3 Message contents

FFS

7.5.6.2.1.5 Test requirements

FFS

7.6 Measurement procedures

7.6.1 Intra-frequency measurements

7.6.2 Inter-frequency measurements

7.6.2.0 Minimum conformance requirements for Inter-frequency measurements

[TS 38.133-f40, clause 9.3.2]

The requirements in Section 9.3 apply, provided:

- The cell being identified or measured is detectable.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in Sections 10.1.4 and 10.1.5 for FR1 and FR2, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in Sections 10.1.9 and 10.1.10 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in Sections 10.1.14 and 10.1.15 for FR1 and FR2, respectively, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to Annex B.2.3 for a corresponding Band.

[TS 38.133-f40, clause 9.3.4]

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter frequency cell within $T_{identify\_inter\_without\_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within $T_{identify\_inter\_with\_index}$. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within $T_{identify\_inter\_without\_index}$.

$$T_{identify\_inter\_without\_index} = (T_{PSS/SSS\_sync\_inter} + T_{SSB\_measurement\_period\_inter}) \text{ ms}$$

$$T_{identify\_inter\_with\_index} = (T_{PSS/SSS\_sync\_inter} + T_{SSB\_measurement\_period\_inter} + T_{SSB\_time\_index\_inter}) \text{ ms}$$

Where:

T_{PSS/SSS_sync_inter}: it is the time period used in PSS/SSS detection given in table 9.3.4-1 and table 9.3.4-2.

$T_{SSB\_time\_index\_inter}$: it is the time period used to acquire the index of the SSB being measured given in table 9.3.4-3 and table 9.3.4-4.

$T_{SSB\_measurement\_period\_inter}$: equal to a measurement period of SSB based measurement given in table 9.3.5-1 and table 9.3.5-2.

M_{pss/sss_sync_inter} : For a UE supporting FR2 power class 1, M_{pss/sss_sync_inter}=64 samples. For a UE supporting FR2 power class 2 (vehicle mounted), M_{pss/sss_sync_inter}=40 samples. For a UE supporting FR2 power class 3 (handheld), M_{pss/sss_sync_inter}=40 samples. For a UE supporting FR2 power class 4, M_{pss/sss_sync}=[40] samples.

$M_{SSB\_index\_inter}$: For a UE supporting power class 1, $M_{SSB\_index\_inter}$ =[40] samples. For a vehicle mounted UE supporting power class 2 (vehicle mounted), M_{pss/sss_sync_inter}=[24] samples.For a UE supporting power class 3 (handheld), $M_{SSB\_index\_inter}$ =[24] samples. For a UE supporting power class 4, $M_{meas\_period\_inter}$ =[TBD] samples.

$M_{meas\_period\_inter}$: For a UE supporting FR2 power class 1, $M_{meas\_period\_inter}$ =64 samples. For a vehicle mounted UE supporting FR2 power class 2 (vehicle mounted), M_{pss/sss_sync_inter}=40 samples.For a UE supporting FR2 power class 3 (handheld), $M_{meas\_period\_inter}$ =40 samples. For a UE supporting FR2 power class 4, $M_{meas\_period\_inter}$ =[40] samples.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within\_gap,i}$ in section 9.1.5.2 for measurement conducted within measurement gaps.

Table 9.3.4-2: Time period for PSS/SSS detection, (Frequency range FR2)

Condition NOTE1,2	T_{PSS/SSS_sync_inter}
No DRX	max[600ms, M_{pss/sss_sync_inter} x max(MGRP, SMTC period)] x $CSSF_{inter}$
DRX cycle ≤ 320ms	max[600ms, (1.5 x M_{pss/sss_sync_inter}) x max(MGRP, SMTC period, DRX cycle)] x $CSSF_{inter}$
DRX cycle > 320ms	M_{pss/sss_sync_inter} x DRX cycle x $CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

Table 9.3.4-4: Time period for time index detection (Frequency range FR2)

Condition NOTE1,2	$T_{SSB\_time\_index\_inter}$
No DRX	max[200ms, $M_{SSB\_index\_inter}$ x max(MGRP, SMTC period)] x $CSSF_{inter}$
DRX cycle ≤ 320ms	max[200ms, (1.5 x $M_{SSB\_index\_inter}$) x max(MGRP, SMTC period, DRX cycle)] x $CSSF_{inter}$
DRX cycle > 320ms	$M_{SSB\_index\_inter}$ x DRX cycle x $CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

[TS 38.133-f40, clause 9.3.5]

When measurement gaps are provided for inter frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in sub-clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 9.3.5-1 and 9.3.5-2:

Table 9.3.5-2: Measurement period for inter-frequency measurements with gaps (Frequency FR2)

Condition NOTE1,2	$T_{SSB\_measurement\_period\_inter}$
No DRX	max[400ms, $M_{meas\_period\_inter}$ x max(MGRP, SMTC period)] x $CSSF_{inter}$
DRX cycle ≤ 320ms	max[400ms, (1.5 x $M_{meas\_period\_inter}$) x max(MGRP, SMTC period, DRX cycle)] x $CSSF_{inter}$
DRX cycle > 320ms	$M_{meas\_period\_inter}$ x DRX cycle x $CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

[TS 38.133-f40, clause 9.3.6.3]

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered measurement reports shall meet the requirements in sections 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be within $T_{identify\_inter\_without\_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index. Otherwise UE shall be able to identify a new detectable inter frequency cell within $T_{identify\_inter\_with\_index}$. Both $T_{identify\_inter\_without\_index}$ and $T_{identify\_inter\_with\_index}$ are defined in clause 9.3.4. When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{identify\_inter\_without\_index}$ or $T_{identify\_inter\_with\_index}$ defined in clause 9.3.4 and then triggers the measurement report as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than $T_{SSB\_measurement\_period\_inter}$ defined in clause 9.3.5 provided the timing to that cell has not changed more than ± 3200 Tc while measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clause 9.3.2, 9.3.4, 9.3.5, 9.3.6.3.

7.6.2.1 NR SA FR2-FR2 event-triggered reporting in non-DRX

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.
- Cell Configuration table in Annex A is undefined.
- Antenna diagram is TBD
- Message content is TBD
- Test case applicability in 38.522 Table 4.2-4 is TBD
- Minimum conformance requirements are TBD
- Test procedure is TBD
- Test requirement is TBD
- Initial conditions is TBD

7.6.2.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.1.

7.6.2.1.4 Test description

7.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.1.4.1-1.

Table 7.6.2.1.4.1-1: NR FR2-FR2 event triggered reporting tests in non-DRX supported test configurations

Test Case ID	Description
7.6.2.1-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note 1: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 7.6.2.1.4.1-1: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
NR RF Channel Number		Config 1	1, 2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1	NR cell 2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1	0	13	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1	39	39	
SMTC-SSB parameters		Config 1	SSB.3 FR2		As specified in clause A.3.10.2
A3-Offset	dB	Config 1	-6		
Hysteresis	dB	Config 1	0		
CP length		Config 1	Normal		
TimeToTrigger	s	Config 1	0		
Filter coefficient		Config 1	0		L3 filtering is not used
DRX		Config 1	OFF		DRX is not used
Time offset between serving and neighbour cells		Config 1	3μs		Synchronous cells.
T1	s	Config 1	5		
T2	s	Config 1	TBD	TBD	

Table 7.6.2.1.4-3: Test Environment parameters for SA inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	TBD		

1. Message contents are defined in clause 7.6.2.1.4.3.
2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

7.6.2.1.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The TCI status for cell2 is defined in table [TBD] and TRS configuration for cell2 is defined in table [TBD].

In test 1 measurement gap pattern configuration # 0 as defined in Table 7.6.2.1.4.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 7.6.2.1.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.1.4.1-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.1.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.1.4.1-2 as appropriate.

TBD

7.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.2.1.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	TBD

7.6.2.1.5 Test requirement

Table 7.6.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.1.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter		Unit	Test configuration	Cell 1		Cell 1	
				T1	T2	T1	T2
NR RF Channel Number			Config 1	1		2	
Duplex mode			Config 1	TDD		TDD	
TDD configuration			Config 1	TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$		MHz	Config 1	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP BW		MHz	Config 1	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1	DLBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.3.1 TDD		-	
CORESET Reference Channel			Config 1	CR.3.1 TDD		-	
SMTC configuration defined in A.3.11.1 and A.3.11.2			Config 1	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1	120		120	
EPRE ratio of PSS to SSS			Config 1	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
UE orientation around TBD axis and TBD axis		degrees	Config 1	NA		TBD	
Relative difference in angle of arrival of cell 3 relative to cell 2		degrees	Config 1	NA		NA	TBD
N_{oc} Note2		dBm/15 kHz Note5		-98		-98	
N_{oc} Note2		dBm/SCS Note4	Config 1	-89		-89	
SS-RSRP Note 3		dBm/SCS Note5	Config 1	-85	-85	-Infinity	-82
$\hat{E}_s/I_{ot}$		dB	Config 1	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$		dB	Config 1	4	4	-Infinity	7
Io Note3		dBm/95.04 MHz Note5	Config 1	-57.55	-57.55	-Infinity	-56.00
Propagation Condition			Config 1	AWGN			

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5:	Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6:	As observed with 0dBi gain antenna at the centre of the quiet zone

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.6.2.2 NR SA FR2-FR2 event-triggered reporting in DRX

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.
- Cell Configuration table in Annex A is undefined.
- Antenna diagram is TBD
- Message content is TBD
- Test case applicability in 38.522 Table 4.2-4 is TBD
- Minimum conformance requirements are TBD
- Test procedure is TBD
- Test requirement is TBD
- Initial conditions is TBD

7.6.2.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.2.

7.6.2.2.4 Test description

7.6.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.2.4.1-1.

Table 7.6.2.2.4.1-1: NR FR2-FR2 event triggered reporting tests in DRX supported test configurations

Test Case ID	Description
7.6.2.2-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note 1: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 7.6.2.2.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
NR RF Channel Number		Config 1	1, 2				Two FR1 NR carrier frequencies is used.
Active cell		Config 1	NR cell 1 (Pcell)				NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1	NR cell 2				NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1	0		13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1	39		39		
SMTC-SSB parameters		Config 1	SSB.3 FR2				As specified in clause A.3.10.2
A3-Offset	dB	Config 1	-6				
Hysteresis	dB	Config 1	0				
CP length		Config 1	Normal				
TimeToTrigger	s	Config 1	0				
Filter coefficient		Config 1	0				L3 filtering is not used
DRX		Config 1	DRX.1	DRX.2	DRX.1	DRX.2	DRX is used
Time offset between serving and neighbour cells		Config 1	3µs				Synchronous cells.
T1	s	Config 1	5				
T2	s	Config 1	TBD	TBD	TBD	TBD	

Table 7.6.2.2.4-3: Test Environment parameters for SA inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.	
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.2.4.1-1.	

Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	TBD		

1. Message contents are defined in clause 7.6.2.2.4.3.
2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

7.6.2.2.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The TCI status for cell2 is defined in table [TBD] and TRS configuration for cell2 is defined in table [TBD].

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 7.6.2.2.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 7.6.2.2..41-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.6.2.2.4.1-2. T1 starts.
3. The SS shall transmit an *RRCReconfiguration* message.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.2.4.1-2.
6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.
7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]
9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),

or:
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.2.4.1-2 as appropriate.

TBD

7.6.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.2.2.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	TBD

7.6.2.2.5 Test requirement

Table 7.6.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Table A.7.6.2.2.1-3: Cell specific test parameters for CA inter-frequency event triggered reporting without SSB time index detection

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
NR RF Channel Number			Config 1	1		2	
TDD configuration			Config 1	TDDConf.3.1		TDDConf.3.1	
Duplex mode			Config 1	TDD		TDD	
$BW_{channel}$		MHz	Config 1	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP BW		MHz	Config 1	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1	DLBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.3.1 TDD		-	
CORESET Reference Channel			Config 1	CR.3.1 TDD		-	
SMTC configuration defined in A.3.11.1 and A.3.11.2			Config 1	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1	120		120	
EPRE ratio of PSS to SSS			Config 1	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
UE orientation around TBD axis and TBD axis		degrees	Config 1	NA		TBD	
Relative difference in angle of arrival of cell 3 relative to cell 2		degrees	Config 1	NA		NA	TBD
N_{oc} Note2		dBm/15 kHz Note5		-98		-98	
N_{oc} Note2		dBm/SCS Note4	Config 1	-89		-89	
SS-RSRP Note 3		dBm/SCS Note5	Config 1	-85	-85	-Infinity	-82
$\hat{E}_s/I_{ot}$		dB	Config 1	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$		dB	Config 1	4	4	-Infinity	7
Io Note3		dBm/95.04 MHz Note5	Config 1	-57.55	-57.55	-Infinity	-56.00
Propagation Condition			Config 1	AWGN			

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5:	Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6:	As observed with 0dBi gain antenna at the centre of the quiet zone

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2 , 3 and 4 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.6.2.3 NR SA FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.
- Cell Configuration table in Annex A is undefined.
- Antenna diagram is TBD
- Message content is TBD
- Test case applicability in 38.522 Table 4.2-4 is TBD
- Minimum conformance requirements are TBD
- Test procedure is TBD
- Test requirement is TBD
- Initial conditions is TBD

7.6.2.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.3.

7.6.2.3.4 Test description

7.6.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.3.4.1-1.

Table 7.6.2.3.4.1-1: NR FR2-FR2 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations

Test Case ID	Description
7.6.2.3-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note 1: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 7.6.2.3.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
NR RF Channel Number		Config 1	1, 2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1	NR cell 2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1	0	13	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1	39	39	
SMTC-SSB parameters		Config 1	SSB.3 FR2		As specified in clause A.3.10.2
A3-Offset	dB	Config 1	-6		
Hysteresis	dB	Config 1	0		
CP length		Config 1	Normal		
TimeToTrigger	s	Config 1	0		
Filter coefficient		Config 1	0		L3 filtering is not used
DRX		Config 1	OFF		DRX is not used
Time offset between serving and neighbour cells		Config 1	3μs		Synchronous cells.
T1	s	Config 1	5		
T2	s	Config 1	TBD	TBD	

Table 7.6.2.3.4-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in non-DRX

<table>
<tr><th>Parameter</th><th colspan="2">Value</th><th>Comment</th></tr>
<tr><td>Test environment</td><td colspan="2">NC</td><td>As specified in TS 38.508-1 [14] clause 4.1.</td></tr>
<tr><td>Test frequencies</td><td colspan="3">As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.</td></tr>
<tr><td>Channel bandwidth</td><td colspan="3">As specified by the test configuration selected from Table 7.6.2.3.4.1-1.</td></tr>
<tr><td>Propagation conditions</td><td colspan="2">AWGN</td><td>As specified in Annex C.2.2.</td></tr>
<tr><td rowspan="2">Connection Diagram</td><td>TE Part</td><td>TBD</td><td rowspan="2">As specified in TS 38.508-1 [14] Annex A.</td></tr>
<tr><td>DUT Part</td><td>TBD</td></tr>
<tr><td>Exceptions to connection diagram</td><td colspan="2">TBD</td><td></td></tr>
</table>

1. Message contents are defined in clause 7.6.2.3.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

7.6.2.3.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The TCI status for cell2 is defined in table [TBD] and TRS configuration for cell2 is defined in table [TBD].

In test 1 measurement gap pattern configuration # 0 as defined in Table 7.6.2.3.4.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 7.6.2.3.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.3.4.1-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.3.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.3.4.1-2 as appropriate.

TBD7.6.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.2.3.4.3-1: Common Exception messages SA inter frequency event triggered reporting with SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	TBD

7.6.2.3.5 Test requirement

Table 7.6.2.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.3.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter		Unit	Test configuration	Cell 1 T1	Cell 1 T2	Cell 2 T1	Cell 2 T2
NR RF Channel Number			Config 1	1		2	
Duplex mode			Config 1	TDD		TDD	
TDD configuration			Config 1	TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$		MHz	Config 1	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP BW		MHz	Config 1	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1	DLBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.3.1 TDD		-	
CORESET Reference Channel			Config 1	CR.3.1 TDD		-	
SMTC configuration defined in A.3.11.1 and A.3.11.2			Config 1	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1	120		120	
EPRE ratio of PSS to SSS			Config 1	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
UE orientation around TBD axis and TBD axis		degrees	Config 1	NA		TBD	
Relative difference in angle of arrival of cell 3 relative to cell 2		degrees	Config 1	NA		NA	TBD
N_{oc} Note2		dBm/15 kHz Note5		-98		-98	
N_{oc} Note2		dBm/SCS Note4	Config 1	-89		-89	
SS-RSRP Note 3		dBm/SCS Note5	Config 1	-85	-85	-Infinity	-82
$\hat{E}_s/I_{ot}$		dB	Config 1	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$		dB	Config 1	4	4	-Infinity	7
Io Note3		dBm/95.04 MHz Note5	Config 1	-57.55	-57.55	-Infinity	-56.00
Propagation Condition			Config 1	AWGN			

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5:	Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6:	As observed with 0dBi gain antenna at the centre of the quiet zone

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.6.2.4 NR SA FR2-FR2 event-triggered reporting in DRX with SSB time index detection

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.
- Cell Configuration table in Annex A is undefined.
- Antenna diagram is TBD
- Message content is TBD
- Test case applicability in 38.522 Table 4.2-4 is TBD
- Minimum conformance requirements are TBD
- Test procedure is TBD
- Test requirement is TBD
- Initial conditions is TBD

7.6.2.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.4.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.4.

7.6.2.4.4 Test description

7.6.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.4.4.1-1.

Table 7.6.2.4.4.1-1: NR FR2-FR2 event triggered reporting tests in DRX with SSB time index detection supported test configurations

Test Case ID	Description
7.6.2.4-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note 1: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 7.6.2.4.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
NR RF Channel Number		Config 1	1, 2				Two FR1 NR carrier frequencies is used.
Active cell		Config 1	NR cell 1 (Pcell)				NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1	NR cell 2				NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1	0		13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1	39		39		
SMTC-SSB parameters		Config 1	SSB.3 FR2				As specified in clause A.3.10.2
A3-Offset	dB	Config 1	-6				
Hysteresis	dB	Config 1	0				
CP length		Config 1	Normal				
TimeToTrigger	s	Config 1	0				
Filter coefficient		Config 1	0				L3 filtering is not used
DRX		Config 1	DRX.1	DRX.2	DRX.1	DRX.2	DRX is used
Time offset between serving and neighbour cells		Config 1	3μs				Synchronous cells.
T1	s	Config 1	5				
T2	s	Config 1	TBD	TBD	TBD	TBD	

Table 7.6.2.4.4-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in non-DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.

Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	TBD		

1. Message contents are defined in clause 7.6.2.4.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

7.6.2.4.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The TCI status for cell2 is defined in table [TBD] and TRS configuration for cell2 is defined in table [TBD].

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 7.6.2.4.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 7.6.2.4.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.4.4.1-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.4.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
or:
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.4.4.1-2 as appropriate.

TBD7.6.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.2.4.4.3-1: Common Exception messages SA inter frequency event triggered reporting with SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	TBD

7.6.2.4.5 Test requirement

Table 7.6.2.4.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.4.5-1: Cell specific test parameters for CA inter-frequency event triggered reporting with SSB time index detection

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
NR RF Channel Number			Config 1	1		2	
Duplex mode			Config 1	TDD		TDD	
TDD configuration			Config 1	TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$		MHz	Config 1	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP BW		MHz	Config 1	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1	DLBWP.0.1		N/A	
	Dedicated DL BWP		Config 1	DLBWP.1.1		N/A	
	Dedicated UL BWP		Config 1	ULBWP.1.1		N/A	
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.3.1 TDD		-	
CORESET Reference Channel			Config 1	CR.3.1 TDD		-	
SMTC configuration defined in A.3.11.1 and A.3.11.2			Config 1	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1	120		120	
EPRE ratio of PSS to SSS			Config 1	0		0	
EPRE ratio of PBCH DMRS to SSS			Config 1	0		0	
EPRE ratio of PBCH to PBCH DMRS			Config 1	0		0	
EPRE ratio of PDCCH DMRS to SSS			Config 1	0		0	
EPRE ratio of PDCCH to PDCCH DMRS			Config 1	0		0	
EPRE ratio of PDSCH DMRS to SSS			Config 1	0		0	
EPRE ratio of PDSCH to PDSCH			Config 1	0		0	
EPRE ratio of OCNG DMRS to SSS(Note 1)			Config 1	0		0	
EPRE ratio of OCNG to OCNG DMRS (Note 1)			Config 1	0		0	
UE orientation around TBD axis and TBD axis		degrees	Config 1	NA		TBD	
Relative difference in angle of arrival of cell 3 relative to cell 2		degrees	Config 1	NA		NA	TBD
N_{oc} Note2		dBm/15 kHz Note5		-98		-98	
N_{oc} Note2		dBm/SCS Note4	Config 1	-89		-89	
SS-RSRP Note 3		dBm/SCS Note5	Config 1	-85	-85	-Infinity	-82
$\hat{E}_s/I_{ot}$		dB	Config 1	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$		dB	Config 1	4	4	-Infinity	7
Io Note3		dBm/95.04 MHz Note5	Config 1	-57.55	-57.55	-Infinity	-56.00
Propagation Condition			Config 1	AWGN			

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5:	Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6:	As observed with 0dBi gain antenna at the centre of the quiet zone

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2 , 3 and 4 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.6.2.5 NR SA FR1-FR2 event-triggered reporting in non-DRX

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.
- Cell Configuration table in Annex A is undefined.
- Antenna diagram is TBD
- Message content is TBD
- Test case applicability in 38.522 Table 4.2-4 is TBD
- Minimum conformance requirements are TBD
- Test procedure is TBD
- Test requirement is TBD
- Initial conditions is TBD

7.6.2.5.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.5.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.5.

7.6.2.5.4 Test description

7.6.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.5.4.1-1.

Table 7.6.2.5.4.1-1: SA FR1-FR2 event triggered reporting tests in non-DRX supported test configurations

<table>
<tr><th>Test Case ID</th><th>Description of serving cell</th><th>Description of target cell</th></tr>
<tr><td>7.6.2.5-1</td><td>NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode</td><td rowspan="3">120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode</td></tr>
<tr><td>7.6.2.5-2</td><td>NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode</td></tr>
<tr><td>7.6.2.5-3</td><td>NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode</td></tr>
<tr><td colspan="3">Note 1: The UE is only required to be tested in one of the supported test configurations
Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell</td></tr>
</table>

Table 7.6.2.5.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
NR RF Channel Number		Config 1,2,3	1, 2		Two NR carrier frequencies is used.
Active cell		Config 1,2,3	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cell 2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0	13	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39	39	
SMTC-SSB parameters on NR RF Channel 1		Config 1	SSB.1 FR1		As specified in clause A.3.10.1
		Config 2	SSB.1 FR1		As specified in clause A.3.10.1
		Config 3	SSB.2 FR1		As specified in clause A.3.10.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3	SSB.3 FR2		As specified in clause A.3.10.2
offsetMO	dB	Config 1,2,3	6		
Hysteresis	dB	Config 1,2,3	0		
a4-Threshold	dBm	Config 1,2,3	TBD		
CP length		Config 1,2,3	Normal		
TimeToTrigger	s	Config 1,2,3	0		
Filter coefficient		Config 1,2,3	0		L3 filtering is not used
DRX		Config 1,2,3	OFF		DRX is not used
Time offset between serving and neighbour cells		Config 1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3µs		Synchronous cells.
T1	s	Config 1,2,3	5		
T2	s	Config 1,2,3	TBD	TBD	

Table 7.6.2.5.4-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	TBD		

1. Message contents are defined in clause 7.6.2.5.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

7.6.2.5.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The TCI status for cell2 is defined in table [TBD] and TRS configuration for cell2 is defined in table [TBD].

In test 1 measurement gap pattern configuration # 0 as defined in Table 7.6.2.5.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 7.6.2.5.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.5.4.1-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.5.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.5.4.1-2 as appropriate.

TBD7.6.2.5.4.3 Message contents

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

Table 7.6.2.5.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	TBD

7.6.2.5.5 Test requirement

Table 7.6.2.5.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.5.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD		TDD	
			Config 2,3	TDD		TDD	
TDD configuration			Config 1	Not Applicable		TDDConf.3.1	
			Config 2	TDDConf.1.1		TDDConf.3.1	
			Config 3	TDDConf.2.1		TDDConf.3.1	
$BW_{channel}$		MHz	Config 1	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 2	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 3	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP BW		MHz	Config 1	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 2	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 3	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1,2,3	DLBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD		-	
			Config 2	SR.1.1 TDD			
			Config 3	SR2.1 TDD			
CORESET Reference Channel			Config 1	CR.1.1 FDD		-	
			Config 2	CR.1.1 TDD			
			Config 3	CR2.1 TDD			
SMTC configuration defined in A.3.11.1 and A.3.11.2			Config 1	SMTC.2		SMTC.2	
			Config 2,3	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15		120	
			Config 3	30		120	
EPRE ratio of PSS to SSS			Config 1,2,3	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
UE orientation around TBD axis and TBD axis		degrees	Config 1,2,3	NA		TBD	
Relative difference in angle of arrival of cell 3 relative to cell 2		degrees	Config 1,2,3	NA		NA	TBD
N_{oc} Note2		dBm/15 kHz Note5		NA		TBD	
N_{oc} Note2		dBm/SCS Note4	Config 1,2	NA		NA	
			Config 3	NA		NA	
SS-RSRP Note 3			Config 1,2	NA	NA	TBD	TBD

	dBm/SCS Note5	Config 3	NA	NA	TBD	TBD
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3	NA	NA	TBD	TBD
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	NA	NA	TBD	TBD
Io[Note3]	dBm/9.36MHz	Config 1,2	NA	NA	-	-
	dBm/38.16MHz	Config 3	NA	NA	-	-
	dBm/95.04 MHz Note5	Config 1,2,3	-	-	TBD	TBD
Propagation Condition		Config 1,2,3	AWGN			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone						

In test 1 with per-UE gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.6.2.6 NR SA FR1-FR2 event-triggered reporting in DRX

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.
- Cell Configuration table in Annex A is undefined.
- Antenna diagram is TBD
- Message content is TBD
- Test case applicability in 38.522 Table 4.2-4 is TBD
- Minimum conformance requirements are TBD
- Test procedure is TBD
- Test requirement is TBD
- Initial conditions is TBD

7.6.2.6.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.6.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

TBD

7.6.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.6.

7.6.2.6.4 Test description

7.6.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.6.4.1-1.

Table 7.6.2.6.4.1-1: SA FR1-FR2 event triggered reporting tests in DRX supported test configurations

<table>
<tr><th>Test Case ID</th><th>Description of serving cell</th><th>Description of target cell</th></tr>
<tr><td>7.6.2.6-1</td><td>NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode</td><td rowspan="3">120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode</td></tr>
<tr><td>7.6.2.6-2</td><td>NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode</td></tr>
<tr><td>7.6.2.6-3</td><td>NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode</td></tr>
<tr><td colspan="3">Note 1: The UE is only required to be tested in one of the supported test configurations

Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell</td></tr>
</table>

Table 7.6.2.6.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
NR RF Channel Number		Config 1,2,3	1, 2				Two NR carrier frequencies is used.
Active cell		Config 1,2,3	NR cell 1 (Pcell)				NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cell 2				NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0		13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39		39		
SMTC-SSB parameters on NR RF Channel 1		Config 1	SSB.1 FR1				As specified in clause A.3.10.1
		Config 2	SSB.1 FR1				As specified in clause A.3.10.1
		Config 3	SSB.2 FR1				As specified in clause A.3.10.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3	SSB.3 FR2				As specified in clause A.3.10.2
offsetMO	dB	Config 1,2,3	6				
Hysteresis	dB	Config 1,2,3	0				
a4-Threshold	dBm	Config 1,2,3	TBD				
CP length		Config 1,2,3	Normal				
TimeToTrigger	s	Config 1,2,3	0				
Filter coefficient		Config 1,2,3	0				L3 filtering is not used
DRX		Config 1,2,3	DRX.1	DRX.2	DRX.1	DRX.2	DRX is used
Time offset between serving and neighbour cells		Config 1	3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3µs				Synchronous cells.
T1	s	Config 1,2,3	5				
T2	s	Config 1,2,3	TBD		TBD		

Table 7.6.2.6.4-3: Test Environment parameters for SA inter-frequency event triggered reporting without SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	TBD		

1. Message contents are defined in clause 7.6.2.6.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

7.6.2.6.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The TCI status for cell2 is defined in table [TBD] and TRS configuration for cell2 is defined in table [TBD].

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 7.6.2.6.4.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 7.6.2.6.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.6.4.1-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.6.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.6.4.1-2 as appropriate.

TBD7.6.2.6.4.3 Message contents

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

Table 7.6.2.6.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	TBD

7.6.2.6.5 Test requirement

Table 7.6.2.6.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.6.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD		TDD	
			Config 2,3	TDD		TDD	
TDD configuration			Config 1	Not Applicable		TDDConf.3.1	
			Config 2	TDDConf.1.1		TDDConf.3.1	
			Config 3	TDDConf.2.1		TDDConf.3.1	
$BW_{channel}$		MHz	Config 1	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 2	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 3	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP BW		MHz	Config 1	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 2	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 3	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1,2,3	DLBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD		-	
			Config 2	SR.1.1 TDD			
			Config 3	SR2.1 TDD			
CORESET Reference Channel			Config 1	CR.1.1 FDD		-	
			Config 2	CR.1.1 TDD			
			Config 3	CR2.1 TDD			
SMTC configuration defined in A.3.11.1 and A.3.11.2			Config 1	SMTC.2		SMTC.2	
			Config 2,3	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15		120	
			Config 3	30		120	
EPRE ratio of PSS to SSS			Config 1,2,3	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
UE orientation around TBD axis and TBD axis		degrees	Config 1,2,3	NA		TBD	
Relative difference in angle of arrival of cell 3 relative to cell 2		degrees	Config 1,2,3	NA		NA	TBD
N_{oc} Note2		dBm/15 kHz Note5		NA		TBD	
N_{oc} Note2		dBm/SCS Note4	Config 1,2	NA		TBD	
			Config 3	NA		TBD	
SS-RSRP Note 3			Config 1,2	NA	NA	TBD	TBD

	dBm/SCS Note5	Config 3	NA	NA	TBD	TBD
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3	NA	NA	TBD	TBD
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	NA	NA	TBD	TBD
Io[Note3]	dBm/9.36MHz	Config 1,2	NA	NA	-	-
	dBm/38.16MHz	Config 3	NA	NA	-	-
	dBm/95.04 MHz Note5	Config 1,2,3	-	-	TBD	TBD
Propagation Condition		Config 1,2,3	AWGN			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone						

In test 1 with per-UE gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2 , 3 and 4 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.6.2.7 NR SA FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.
- Cell Configuration table in Annex A is undefined.

- Antenna diagram is TBD
- Message content is TBD
- Test case applicability in 38.522 Table 4.2-4 is TBD
- Minimum conformance requirements are TBD
- Test procedure is TBD
- Test requirement is TBD
- Initial conditions is TBD

7.6.2.7.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.7.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

TBD

7.6.2.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.7.

7.6.2.7.4 Test description

7.6.2.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.7.4.1-1.

Table 7.6.2.7.4.1-1: SA FR1-FR2 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations

<table>
<tr><th>Test Case ID</th><th>Description of serving cell</th><th>Description of target cell</th></tr>
<tr><td>7.6.2.7-1</td><td>NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode</td><td rowspan="3">120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode</td></tr>
<tr><td>7.6.2.7-2</td><td>NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode</td></tr>
<tr><td>7.6.2.7-3</td><td>NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode</td></tr>
<tr><td colspan="3">Note 1: The UE is only required to be tested in one of the supported test configurations
Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell</td></tr>
</table>

Table 7.6.2.7.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
NR RF Channel Number		Config 1,2,3	1, 2		Two NR carrier frequencies is used.
Active cell		Config 1,2,3	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cell 2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0	13	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39	39	
SMTC-SSB parameters on NR RF Channel 1		Config 1	SSB.1 FR1		As specified in clause A.3.10.1
		Config 2	SSB.1 FR1		As specified in clause A.3.10.1
		Config 3	SSB.2 FR1		As specified in clause A.3.10.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3	SSB.3 FR2		As specified in clause A.3.10.2
offsetMO	dB	Config 1,2,3	6		
Hysteresis	dB	Config 1,2,3	0		
a4-Threshold	dBm	Config 1,2,3,4,5,6	TBD		
CP length		Config 1,2,3	Normal		
TimeToTrigger	s	Config 1,2,3	0		
Filter coefficient		Config 1,2,3	0		L3 filtering is not used
DRX		Config 1,2,3	OFF		DRX is not used
Time offset between serving and neighbour cells		Config 1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3µs		Synchronous cells.
T1	s	Config 1,2,3	5		
T2	s	Config 1,2,3	TBD	TBD	

Table 7.6.2.6.4-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.7.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	TBD		

1. Message contents are defined in clause 7.6.2.7.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

7.6.2.7.4.2 Test procedure

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The TCI status for cell2 is defined in table [TBD] and TRS configuration for cell2 is defined in table [TBD].

In test 1 measurement gap pattern configuration # 0 as defined in Table 7.6.2.7.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 7.6.2.7.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.7.4.1-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.7.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.7.4.1-2 as appropriate.

TBD7.6.2.7.4.3 Message contents

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

Table 7.6.2.7.4.3-1: Common Exception messages SA inter frequency event triggered reporting with SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	TBD

7.6.2.7.5 Test requirement

Table 7.6.2.7.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.7.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

<table>
<tr><th colspan="2" rowspan="2">Parameter</th><th rowspan="2">Unit</th><th rowspan="2">Test configuration</th><th colspan="2">Cell 1</th><th colspan="2">Cell 2</th></tr>
<tr><th>T1</th><th>T2</th><th>T1</th><th>T2</th></tr>
<tr><td colspan="2">NR RF Channel Number</td><td></td><td>Config 1,2,3</td><td colspan="2">1</td><td colspan="2">2</td></tr>
<tr><td colspan="2" rowspan="2">Duplex mode</td><td></td><td>Config 1</td><td colspan="2">FDD</td><td colspan="2">TDD</td></tr>
<tr><td></td><td>Config 2,3</td><td colspan="2">TDD</td><td colspan="2">TDD</td></tr>
<tr><td colspan="2" rowspan="3">TDD configuration</td><td></td><td>Config 1</td><td colspan="2">Not Applicable</td><td colspan="2">TDDConf.3.1</td></tr>
<tr><td></td><td>Config 2</td><td colspan="2">TDDConf.1.1</td><td colspan="2">TDDConf.3.1</td></tr>
<tr><td></td><td>Config 3</td><td colspan="2">TDDConf.2.1</td><td colspan="2">TDDConf.3.1</td></tr>
<tr><td colspan="2" rowspan="3">$BW_{channel}$</td><td rowspan="3">MHz</td><td>Config 1</td><td colspan="2">10: $N_{RB,c}$ = 52</td><td colspan="2">100: $N_{RB,c}$ = 66</td></tr>
<tr><td>Config 2</td><td colspan="2">10: $N_{RB,c}$ = 52</td><td colspan="2">100: $N_{RB,c}$ = 66</td></tr>
<tr><td>Config 3</td><td colspan="2">40: $N_{RB,c}$ = 106</td><td colspan="2">100: $N_{RB,c}$ = 66</td></tr>
<tr><td colspan="2" rowspan="3">BWP BW</td><td rowspan="3">MHz</td><td>Config 1</td><td colspan="2">10: $N_{RB,c}$ = 52</td><td colspan="2">100: $N_{RB,c}$ = 66</td></tr>
<tr><td>Config 2</td><td colspan="2">10: $N_{RB,c}$ = 52</td><td colspan="2">100: $N_{RB,c}$ = 66</td></tr>
<tr><td>Config 3</td><td colspan="2">40: $N_{RB,c}$ = 106</td><td colspan="2">100: $N_{RB,c}$ = 66</td></tr>
<tr><td rowspan="3">BWP configuration</td><td>Initial DL BWP</td><td></td><td rowspan="3">Config 1,2,3</td><td colspan="2">DLBWP.0.1</td><td colspan="2">N/A</td></tr>
<tr><td>Dedicated DL BWP</td><td></td><td colspan="2">DLBWP.1.1</td><td colspan="2">N/A</td></tr>
<tr><td>Dedicated UL BWP</td><td></td><td colspan="2">ULBWP.1.1</td><td colspan="2">N/A</td></tr>
<tr><td colspan="2">OCNG Patterns defined in A.3.2.1.1 (OP.1)</td><td></td><td>Config 1,2,3</td><td colspan="2">OP.1</td><td colspan="2">OP.1</td></tr>
<tr><td colspan="2" rowspan="3">PDSCH Reference measurement channel</td><td></td><td>Config 1</td><td colspan="2">SR.1.1 FDD</td><td colspan="2" rowspan="3">-</td></tr>
<tr><td></td><td>Config 2</td><td colspan="2">SR.1.1 TDD</td></tr>
<tr><td></td><td>Config 3</td><td colspan="2">SR2.1 TDD</td></tr>
<tr><td colspan="2" rowspan="3">CORESET Reference Channel</td><td></td><td>Config 1</td><td colspan="2">CR.1.1 FDD</td><td colspan="2" rowspan="3">-</td></tr>
<tr><td></td><td>Config 2</td><td colspan="2">CR.1.1 TDD</td></tr>
<tr><td></td><td>Config 3</td><td colspan="2">CR2.1 TDD</td></tr>
<tr><td colspan="2" rowspan="2">SMTC configuration defined in A.3.11.1 and A.3.11.2</td><td></td><td>Config 1</td><td colspan="2">SMTC.2</td><td colspan="2">SMTC.2</td></tr>
<tr><td></td><td>Config 2,3</td><td colspan="2">SMTC.1</td><td colspan="2">SMTC.1</td></tr>
<tr><td colspan="2" rowspan="2">PDSCH/PDCCH subcarrier spacing</td><td rowspan="2">kHz</td><td>Config 1,2</td><td colspan="2">15</td><td colspan="2">120</td></tr>
<tr><td>Config 3</td><td colspan="2">30</td><td colspan="2">120</td></tr>
<tr><td colspan="2">EPRE ratio of PSS to SSS</td><td></td><td rowspan="9">Config 1,2,3</td><td colspan="2" rowspan="9">0</td><td colspan="2" rowspan="9">0</td></tr>
<tr><td colspan="2">EPRE ratio of PBCH DMRS to SSS</td><td></td></tr>
<tr><td colspan="2">EPRE ratio of PBCH to PBCH DMRS</td><td></td></tr>
<tr><td colspan="2">EPRE ratio of PDCCH DMRS to SSS</td><td></td></tr>
<tr><td colspan="2">EPRE ratio of PDCCH to PDCCH DMRS</td><td></td></tr>
<tr><td colspan="2">EPRE ratio of PDSCH DMRS to SSS</td><td></td></tr>
<tr><td colspan="2">EPRE ratio of PDSCH to PDSCH</td><td></td></tr>
<tr><td colspan="2">EPRE ratio of OCNG DMRS to SSS(Note 1)</td><td></td></tr>
<tr><td colspan="2">EPRE ratio of OCNG to OCNG DMRS (Note 1)</td><td></td></tr>
<tr><td colspan="2">UE orientation around TBD axis and TBD axis</td><td>degrees</td><td>Config 1,2,3</td><td colspan="2">NA</td><td colspan="2">TBD</td></tr>
<tr><td colspan="2">Relative difference in angle of arrival of cell 3 relative to cell 2</td><td>degrees</td><td>Config 1,2,3</td><td colspan="2">NA</td><td>NA</td><td>TBD</td></tr>
<tr><td colspan="2">N_{oc} Note2</td><td>dBm/15 kHz Note5</td><td></td><td colspan="2">NA</td><td colspan="2">NA</td></tr>
<tr><td colspan="2" rowspan="2">N_{oc} Note2</td><td rowspan="2">dBm/SCS Note4</td><td>Config 1,2</td><td colspan="2">NA</td><td colspan="2">NA</td></tr>
<tr><td>Config 3</td><td colspan="2">NA</td><td colspan="2">NA</td></tr>
<tr><td colspan="2">SS-RSRP Note 3</td><td></td><td>Config 1,2</td><td>NA</td><td>NA</td><td>TBD</td><td>TBD</td></tr>
</table>

	dBm/SCS Note5	Config 3	NA	NA	TBD	TBD
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3	NA	NA	TBD	TBD
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	NA	NA	TBD	TBD
Io[Note3]	dBm/9.36MHz	Config 1,2	NA	NA	-	-
	dBm/38.16MHz	Config 3	NA	NA	-	-
	dBm/95.04 MHz Note5	Config 1,2,3	-	-	TBD	TBD
Propagation Condition		Config 1,2,3	AWGN			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone						

In test 1 with per-UE gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.6.2.8 NR SA FR1-FR2 event-triggered reporting in DRX with SSB time index detection

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test tolerances and Test system uncertainties applicable to this test are undefined.
- Cell Configuration table in Annex A is undefined.
- Antenna diagram is TBD
- Message content is TBD
- Test case applicability in 38.522 Table 4.2-4 is TBD
- Minimum conformance requirements are TBD
- Test procedure is TBD
- Test requirement is TBD

- Initial conditions is TBD

7.6.2.8.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.8.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.2.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.8.

7.6.2.8.4 Test description

7.6.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.8.4.1-1.

Table 7.6.2.8.4.1-1: SA FR1-FR2 event triggered reporting tests in DRX with SSB time index detection supported test configurations

Test Case ID	Description of serving cell	Description of target cell
7.6.2.8-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.6.2.8-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
7.6.2.8-3	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell		

Table 7.6.2.8.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
NR RF Channel Number		Config 1,2,3	1, 2				Two NR carrier frequencies is used.
Active cell		Config 1,2,3	NR cell 1 (Pcell)				NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cell 2				NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0		13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39		39		
SMTC-SSB parameters on NR RF Channel 1		Config 1	SSB.1 FR1				As specified in clause A.3.10.1
		Config 2	SSB.1 FR1				As specified in clause A.3.10.1
		Config 3	SSB.2 FR1				As specified in clause A.3.10.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3	SSB.3 FR2				As specified in clause A.3.10.2
offsetMO	dB	Config 1,2,3	6				
Hysteresis	dB	Config 1,2,3	0				
a4-Threshold	dBm	Config 1,2,3	TBD				
CP length		Config 1,2,3	Normal				
TimeToTrigger	s	Config 1,2,3	0				
Filter coefficient		Config 1,2,3	0				L3 filtering is not used
DRX		Config 1,2,3	DRX.1	DRX.2	DRX.1	DRX.2	DRX is used
Time offset between serving and neighbour cells		Config 1	3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3µs				Synchronous cells.
T1	s	Config 1,2,3	5				
T2	s	Config 1,2,3	TBD		TBD		

Table 7.6.2.8.4-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.8.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	TBD		

1. Message contents are defined in clause 7.6.2.8.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

7.6.2.8.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. TCI status for cell2 is defined in table [TBD] and TRS configuration for cell2 is defined in table [TBD].

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 7.6.2.8.4.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 7.6.2.8.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.8.4.1-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.8.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than TBD for Test 1 and TBD for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.8.4.1-2 as appropriate.

TBD7.6.2.8.4.3 Message contents

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

Table 7.6.2.8.4.3-1: Common Exception messages SA inter frequency event triggered reporting with SSB time index detection in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	TBD

7.6.2.8.5 Test requirement

Table 7.6.2.8.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.8.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection in DRX

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD		TDD	
			Config 2,3	TDD		TDD	
TDD configuration			Config 1	Not Applicable		TDDConf.3.1	
			Config 2	TDDConf.1.1		TDDConf.3.1	
			Config 3	TDDConf.2.1		TDDConf.3.1	
$BW_{channel}$		MHz	Config 1	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 2	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 3	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP BW		MHz	Config 1	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 2	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 3	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1,2,3	DLBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD		-	
			Config 2	SR.1.1 TDD			
			Config 3	SR2.1 TDD			
CORESET Reference Channel			Config 1	CR.1.1 FDD		-	
			Config 2	CR.1.1 TDD			
			Config 3	CR2.1 TDD			
SMTC configuration defined in A.3.11.1 and A.3.11.2			Config 1	SMTC.2		SMTC.2	
			Config 2,3	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15		120	
			Config 3	30		120	
EPRE ratio of PSS to SSS			Config 1,2,3	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
UE orientation around TBD axis and TBD axis		degrees	Config 1,2,3	NA		TBD	
Relative difference in angle of arrival of cell 3 relative to cell 2		degrees	Config 1,2,3	NA		NA	TBD
N_{oc} Note2		dBm/15 kHz Note5		NA		NA	
N_{oc} Note2		dBm/SCS Note4	Config 1,2	NA		NA	
			Config 3	NA		NA	
SS-RSRP Note 3			Config 1,2	NA	NA	TBD	TBD

	dBm/SCS Note5	Config 3	NA	NA	TBD	TBD
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3	NA	NA	TBD	TBD
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	NA	NA	TBD	TBD
Io Note3	dBm/9.36MHz	Config 1,2	NA	NA	-	-
	dBm/38.16MHz	Config 3	NA	NA	-	-
	dBm/95.04 MHz Note5	Config 1,2,3	-	-	TBD	TBD
Propagation Condition		Config 1,2,3	AWGN			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone						

In test 1 with per-UE gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than [TBD] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2 , 3 and 4 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.7 Measurement performance requirements

7.7.1 SS-RSRP

7.7.1.1 Intra-frequency measurements

7.7.1.2 Inter-frequency measurements

7.7.1.3 Inter-frequency measurements between FR1 and FR2

7.7.1.3.1 NR SA FR1-FR2 SS-RSRP absolute measurement accuracy

Editor's Note:

- Test tolerance analysis is missing.
- Message contents are TBD.
- Connection diagram is TBD.
- Cell mapping is TBD.
- Table 7.7.1.3.1.5-3 of reported value is FFS

7.7.1.3.1.1 Test Purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy with FR1 serving cell and FR2 target cell.

7.7.1.3.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

7.7.1.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.1.3.

7.7.1.3.1.4 Test description

7.7.1.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.1.3.1.4.1-1.

Table 7.7.1.3.1.4.1-1: Applicable NR configurations for FR1 inter-frequency SS-RSRP accuracy test

Config	Description of serving cell	Description of target cell
1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	

Configure the test equipment and the DUT according to the parameters in Table 7.7.1.3.1.4.1-2.

Table 7.7.1.3.1.4.1-2: Initial conditions for NR SA FR1-FR2 SS-RSRP absolute measurement accuracy

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.7.1.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.7.1.3.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR FR2 neighbour cell (the target cell for SS-RSRP measurements) on a different frequency than the PCell. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

7.7.1.3.1.4.2 Test procedure

Same as in clause 6.7.1.2.1.4.2 but replacing Table 6.7.1.2.1.5-1 and 6.7.1.2.1.5-2 with 7.7.1.3.1.5-1 and 7.7.1.3.1.5-2, respectively.

7.7.1.3.1.4.3 Message contents

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

TBD

7.7.1.3.1.5 Test requirement

Table 7.7.1.3.1.5-1 and Table 7.7.1.3.1.5-2 define the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 7.7.1.3.1.5-1 and 7.7.1.3.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 7.7.1.3.1.5-3.

Table 7.7.1.3.1.5-1: SS-RSRP inter-frequency test parameters

Parameter	Config	Unit	Test 1		Test 2	
			Cell 1	Cell 2	Cell 1	Cell 2

SSB ARFCN	1~3		freq1	freq2	freq1	freq2
$BW_{channel}$	1	MHz	10: $N_{RB,c}$ = 52	100: $N_{RB,c}$ = 66	10: $N_{RB,c}$ = 52	100: $N_{RB,c}$ = 66
	2		10: $N_{RB,c}$ = 52		10: $N_{RB,c}$ = 52	
	3		40: $N_{RB,c}$ = 106		40: $N_{RB,c}$ = 106	
Duplex mode	1		FDD	TDD	FDD	TDD
	2		TDD		TDD	
	3		TDD		TDD	
TDD configuration	1		N/A	TDDConf. 3.1	N/A	TDDConf. 3.1
	2		TDDConf. 1.1		TDDConf. 1.1	
	3		TDDConf. 2.1		TDDConf. 2.1	
PDSCH Reference measurement channel	1		SR.1.1 FDD	-	SR.1.1 FDD	-
	2		SR.1.1 TDD		SR.1.1 TDD	
	3		SR.2.1 FDD		SR.2.1 FDD	
RMSI CORESET Reference Channel	1		CR.1.1 FDD	-	CR.1.1 FDD	-
	2		CR.1.1 TDD	-	CR.1.1 TDD	-
	3		CR.2.1 FDD	-	CR.2.1 FDD	-
Dedicated CORESET Reference Channel	1		CCR.1.1 FDD	-	CCR.1.1 FDD	-
	2		CCR.1.1 TDD	-	CCR.1.1 TDD	-
	3		CCR.2.1 TDD	-	CCR.2.1 TDD	-
SSB configuration	1		SSB.1 FR1	SSB.1 FR2	SSB.1 FR1	SSB.1 FR2
	2		SSB.1 FR1		SSB.1 FR1	
	3		SSB.2 FR1		SSB.2 FR1	
OCNG Patterns	1~3		OP.1		OP.1	
DL BWP	1~3		DLBWP.1		DLBWP.1	
UL BWP	1~3		ULBWP.1		ULBWP.1	
SMTC configuration	1~3		SMTC.1		SMTC.1	
EPRE ratio of PSS to SSS	1~3	dB	0	0	0	0
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH DMRS						
EPRE ratio of OCNG DMRS to SSS Note 1						
EPRE ratio of OCNG to OCNG DMRS Note 1						
Propagation condition	1~3	-	AWGN		AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.						

Table 7.7.1.3.1.5-2: SS-RSRP inter-frequency OTA related test parameters

Parameter		Config	Unit	Test 1		Test 2	
				Cell 1	Cell 2	Cell 1	Cell 2
N_{oc} Note2	NR_FDD_FR1_A, NR_TDD_FR1_A	1~3	dBm/15 kHz	TBD		TBD	TBD
	NR_FDD_FR1_B						TBD
	NR_TDD_FR1_C						TBD

	NR_FDD_FR1_D, NR_TDD_FR1_D						TBD
	NR_FDD_FR1_E, NR_TDD_FR1_E						TBD
	NR_FDD_FR1_G						TBD
	NR_FDD_FR1_H						TBD
N_{oc} Note2	NR_FDD_FR1_A, NR_TDD_FR1_A	1,2,4,5	dBm/SSB SCS	TBD	TBD	TBD	TBD
	NR_FDD_FR1_B						TBD
	NR_TDD_FR1_C						TBD
	NR_FDD_FR1_D, NR_TDD_FR1_D						TBD
	NR_FDD_FR1_E, NR_TDD_FR1_E						TBD
	NR_FDD_FR1_G						TBD
	NR_FDD_FR1_H						TBD
	NR_FDD_FR1_A, NR_TDD_FR1_A	3		TBD		TBD	TBD
	NR_FDD_FR1_B						TBD
	NR_TDD_FR1_C						TBD
	NR_FDD_FR1_D, NR_TDD_FR1_D						TBD
	NR_FDD_FR1_E, NR_TDD_FR1_E						TBD
	NR_FDD_FR1_G						TBD
	NR_FDD_FR1_H						TBD
$\hat{E}_s/I_{ot}$		1~3	dB	TBD	TBD	TBD	TBD
SS-RSRP Note3	NR_FDD_FR1_A, NR_TDD_FR1_A	1,2,4,5	dBm/SCS	TBD	TBD	TBD	TBD
	NR_FDD_FR1_B						TBD
	NR_TDD_FR1_C						TBD
	NR_FDD_FR1_D, NR_TDD_FR1_D						TBD
	NR_FDD_FR1_E, NR_TDD_FR1_E						TBD
	NR_FDD_FR1_G						TBD
	NR_FDD_FR1_H						TBD
	NR_FDD_FR1_A, NR_TDD_FR1_A	3		TBD		TBD	TBD
	NR_FDD_FR1_B						TBD
	NR_TDD_FR1_C						TBD
	NR_FDD_FR1_D, NR_TDD_FR1_D						TBD
	NR_FDD_FR1_E, NR_TDD_FR1_E						TBD
	NR_FDD_FR1_G						TBD
	NR_FDD_FR1_H						TBD
Io Note3	NR_FDD_FR1_A, NR_TDD_FR1_A	1,2,4,5	dBm/9.36MHz	N/A		TBD	
	NR_FDD_FR1_B					TBD	
	NR_TDD_FR1_C					TBD	
	NR_FDD_FR1_D, NR_TDD_FR1_D					TBD	
	NR_FDD_FR1_E, NR_TDD_FR1_E					TBD	
	NR_FDD_FR1_G					TBD	
	NR_FDD_FR1_H					TBD	
	NR_FDD_FR1_A, NR_TDD_FR1_A	3	dBm/38.16MHz	N/A		TBD	
	NR_FDD_FR1_B					TBD	
	NR_TDD_FR1_C					TBD	
	NR_FDD_FR1_D, NR_TDD_FR1_D					TBD	
	NR_FDD_FR1_E, NR_TDD_FR1_E					TBD	
	NR_FDD_FR1_G					TBD	
	NR_FDD_FR1_H					TBD	
	NR_TDD_FR2_A	1~3	dBm/95.04MHz	N/A	TBD	TBD	
	NR_TDD_FR2_B					TBD	
	NR_TDD_FR2_F					TBD	
	NR_TDD_FR2_G					TBD	
	NR_TDD_FR2_T					TBD	

	NR_TDD_FR2_Y					TBD	
$\hat{E}_s/N_{oc}$		1~3	dB	TBD	TBD	TBD	TBD
Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.							

Table 7.7.1.3.1.5-3: SS-RSRP inter-frequency absolute accuracy requirements for the reported values

FFS

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

7.7.1.3.2 NR SA FR1-FR2 SS-RSRP relative measurement accuracy

Editor's Note:

- Test tolerance analysis is missing.

- Message contents are TBD.

- Connection diagram is TBD.

- Cell mapping is TBD.

- Table 7.7.1.3.2.5-3 of reported value is FFS

7.7.1.3.2.1 Test Purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP relative measurement accuracy with FR1 serving cell and FR2 target cell.

7.7.1.3.2.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

7.7.1.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.1.0.4

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.1.3.

7.7.1.3.2.4 Test description

7.7.1.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.1.3.2.4.1-1.

Table 7.7.1.3.2.4.1-1: Applicable NR configurations for FR1 inter-frequency SS-RSRP accuracy test

Config	Description of serving cell	Description of target cell
1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	

Configure the test equipment and the DUT according to the parameters in Table 7.7.1.3.2.4.1-2.

Table 7.7.1.3.2.4.1-2: Initial conditions for NR SA FR1-FR2 SS-RSRP relative measurement accuracy

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.7.1.3.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.7.1.3.2.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR FR2 neighbour cell (the target cell for SS-RSRP measurements) on a different frequency than the PCell. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

7.7.1.3.2.4.2 Test procedure

Same as in clause 6.7.1.2.2.4.2 but replacing Table 6.7.1.2.2.5-1 and 6.7.1.2.2.5-2 with 7.7.1.3.2.5-1 and 7.7.1.3.2.5-2, respectively.

7.7.1.3.2.4.3 Message contents

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

TBD

7.7.1.3.2.5 Test requirement

Table 7.7.1.3.2.5-1 and Table 7.7.1.3.2.5-2 define the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 7.7.1.3.2.5-1 and 7.7.1.3.2.5-2 shall meet the corresponding relative accuracy requirements in Table 7.7.1.3.2.5-3.

Table 7.7.1.3.2.5-1: SS-RSRP inter-frequency test parameters

Parameter	Config	Unit	Test 1		Test 2	
			Cell 1	Cell 2	Cell 1	Cell 2

SSB ARFCN	1~3		freq1	freq2	freq1	freq2
$BW_{channel}$	1	MHz	10: $N_{RB,c}$ = 52	100: $N_{RB,c}$ = 66	10: $N_{RB,c}$ = 52	100: $N_{RB,c}$ = 66
	2		10: $N_{RB,c}$ = 52		10: $N_{RB,c}$ = 52	
	3		40: $N_{RB,c}$ = 106		40: $N_{RB,c}$ = 106	
Duplex mode	1		FDD	TDD	FDD	TDD
	2		TDD		TDD	
	3		TDD		TDD	
TDD configuration	1		N/A	TDDConf. 3.1	N/A	TDDConf. 3.1
	2		TDDConf. 1.1		TDDConf. 1.1	
	3		TDDConf. 2.1		TDDConf. 2.1	
PDSCH Reference measurement channel	1		SR.1.1 FDD	-	SR.1.1 FDD	-
	2		SR.1.1 TDD		SR.1.1 TDD	
	3		SR.2.1 FDD		SR.2.1 FDD	
RMSI CORESET Reference Channel	1		CR.1.1 FDD	-	CR.1.1 FDD	-
	2		CR.1.1 TDD	-	CR.1.1 TDD	-
	3		CR.2.1 FDD	-	CR.2.1 FDD	-
Dedicated CORESET Reference Channel	1		CCR.1.1 FDD	-	CCR.1.1 FDD	-
	2		CCR.1.1 TDD	-	CCR.1.1 TDD	-
	3		CCR.2.1 TDD	-	CCR.2.1 TDD	-
SSB configuration	1		SSB.1 FR1	SSB.1 FR2	SSB.1 FR1	SSB.1 FR2
	2		SSB.1 FR1		SSB.1 FR1	
	3		SSB.2 FR1		SSB.2 FR1	
OCNG Patterns	1~3		OP.1		OP.1	
DL BWP	1~3		DLBWP.1		DLBWP.1	
UL BWP	1~3		ULBWP.1		ULBWP.1	
SMTC configuration	1~3		SMTC.1		SMTC.1	
EPRE ratio of PSS to SSS	1~3	dB	0	0	0	0
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH DMRS						
EPRE ratio of OCNG DMRS to SSS Note 1						
EPRE ratio of OCNG to OCNG DMRS Note 1						
Propagation condition	1~3	-	AWGN		AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.						

Table 7.7.1.3.2.5-2: SS-RSRP inter-frequency OTA related test parameters

Parameter		Config	Unit	Test 1		Test 2	
				Cell 1	Cell 2	Cell 1	Cell 2
N_{oc} Note2	NR_FDD_FR1_A, NR_TDD_FR1_A	1~3	dBm/15 kHz	TBD		TBD	TBD
	NR_FDD_FR1_B						TBD
	NR_TDD_FR1_C						TBD

	NR_FDD_FR1_D, NR_TDD_FR1_D						TBD
	NR_FDD_FR1_E, NR_TDD_FR1_E						TBD
	NR_FDD_FR1_G						TBD
	NR_FDD_FR1_H						TBD
N_{oc} Note2	NR_FDD_FR1_A, NR_TDD_FR1_A	1,2,4,5	dBm/SSB SCS	TBD	TBD	TBD	TBD
	NR_FDD_FR1_B						TBD
	NR_TDD_FR1_C						TBD
	NR_FDD_FR1_D, NR_TDD_FR1_D						TBD
	NR_FDD_FR1_E, NR_TDD_FR1_E						TBD
	NR_FDD_FR1_G						TBD
	NR_FDD_FR1_H						TBD
	NR_FDD_FR1_A, NR_TDD_FR1_A	3		TBD		TBD	TBD
	NR_FDD_FR1_B						TBD
	NR_TDD_FR1_C						TBD
	NR_FDD_FR1_D, NR_TDD_FR1_D						TBD
	NR_FDD_FR1_E, NR_TDD_FR1_E						TBD
	NR_FDD_FR1_G						TBD
	NR_FDD_FR1_H						TBD
$\hat{E}_s/I_{ot}$		1~3	dB	TBD	TBD	TBD	TBD
SS-RSRP Note3	NR_FDD_FR1_A, NR_TDD_FR1_A	1,2,4,5	dBm/SCS	TBD	TBD	TBD	TBD
	NR_FDD_FR1_B						TBD
	NR_TDD_FR1_C						TBD
	NR_FDD_FR1_D, NR_TDD_FR1_D						TBD
	NR_FDD_FR1_E, NR_TDD_FR1_E						TBD
	NR_FDD_FR1_G						TBD
	NR_FDD_FR1_H						TBD
	NR_FDD_FR1_A, NR_TDD_FR1_A	3		TBD		TBD	TBD
	NR_FDD_FR1_B						TBD
	NR_TDD_FR1_C						TBD
	NR_FDD_FR1_D, NR_TDD_FR1_D						TBD
	NR_FDD_FR1_E, NR_TDD_FR1_E						TBD
	NR_FDD_FR1_G						TBD
	NR_FDD_FR1_H						TBD
Io Note3	NR_FDD_FR1_A, NR_TDD_FR1_A	1,2,4,5	dBm/9.36MHz	N/A		TBD	
	NR_FDD_FR1_B					TBD	
	NR_TDD_FR1_C					TBD	
	NR_FDD_FR1_D, NR_TDD_FR1_D					TBD	
	NR_FDD_FR1_E, NR_TDD_FR1_E					TBD	
	NR_FDD_FR1_G					TBD	
	NR_FDD_FR1_H					TBD	
	NR_FDD_FR1_A, NR_TDD_FR1_A	3	dBm/38.16MHz	N/A		TBD	
	NR_FDD_FR1_B					TBD	
	NR_TDD_FR1_C					TBD	
	NR_FDD_FR1_D, NR_TDD_FR1_D					TBD	
	NR_FDD_FR1_E, NR_TDD_FR1_E					TBD	
	NR_FDD_FR1_G					TBD	
	NR_FDD_FR1_H					TBD	
	NR_TDD_FR2_A	1~3	dBm/95.04MHz	N/A	TBD	TBD	
	NR_TDD_FR2_B					TBD	
	NR_TDD_FR2_F					TBD	
	NR_TDD_FR2_G					TBD	
	NR_TDD_FR2_T					TBD	

	NR_TDD_FR2_Y					TBD	
$\hat{E}_s/N_{oc}$		1~3	dB	TBD	TBD	TBD	TBD
Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.							

Table 7.7.1.3.2.5-3: SS-RSRP inter-frequency relative accuracy requirements for the reported values

FFS

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

7.7.2 SS-RSRQ

7.7.3 SS-SINR

Annex A (normative): RRM test configurations

A.1 Reference measurement channels

This section contains the Reference Measurement Channels (RMC) to be used for the RRM test scenarios in Sections 4 to 7 of this document.

A.1.1 PDSCH

A.1.1.1 FDD

Table A.1.1.1-1: PDSCH Reference Measurement Channels for SCS = 15 kHz for FDD

Parameter	Unit	Value
Reference channel		SR.1.1 FDD
Channel bandwidth	MHz	10
Number of transmitter antennas		1
Allocated resource blocks for PDSCH Note 1		24
Allocated slots per Radio Frame		10
Radio frame containing SSB	slots	Note 5
Radio frame not containing SSB	slots	[10]
MCS index		4
Modulation		QPSK
Target Coding Rate		1/3
Number of control symbols		2
PDSCH mapping type		Type A
Information Bit Payload		
For slots with RMSI Note 2	Bits	[1864]
Number of Code Blocks per slot		1
Binary Channel Bits Per slot		
For slots with RMSI Note 2, 4	Bits	[6048]
Note 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block. Note 2: PDSCH is scheduled on the slots with RMSI. Note 3: If necessary, the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in 3GPP TS 38.213 [8]. Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1. Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in section A.3.		

A.1.1.2 TDD

Table A.1.1.2-1: PDSCH Reference Measurement Channels for SCS = 15 kHz for TDD

Parameter	Unit	Value
Reference channel		SR.1.1 TDD
Channel bandwidth	MHz	10
Number of transmitter antennas		1
Allocated resource blocks for PDSCH Note 1		24
Allocated slots per Radio Frame		
Radio frame containing SSB	slots	Note 5
Radio frame not containing SSB	slots	[4]
MCS table		64QAM
MCS index		4
Modulation		QPSK
Target Coding Rate		1/3
Number of control symbols		2
PDSCH mapping type		Type A
Information Bit Payload		
For slots with RMSI Note 2	Bits	[1864]
Number of Code Blocks per slot		1
Binary Channel Bits Per slot		
For slots with RMSI Note 2, 4	Bits	[6048]

Note 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.
Note 2: PDSCH is scheduled on the slots with RMSI.
Note 3: If necessary, the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in 3GPP TS 38.213 [8].
Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.
Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in section A.3.10.

Table A.1.1.2-2: PDSCH Reference Measurement Channels for SCS = 30 kHz for TDD

Parameter	Unit	Value
Reference channel		SR.2.1 TDD
Channel bandwidth	MHz	40
Number of transmitter antennas		1
Allocated resource blocks for PDSCH Note 1		24
Allocated slots per Radio Frame		
Radio frame containing SSB	slots	Note 5
Radio frame not containing SSB	slots	[10]
MCS table		64QAM
MCS index		4
Modulation		QPSK
Target Coding Rate		1/3
Number of control symbols		2
PDSCH mapping type		Type A
Information Bit Payload		
For slots with RMSI Note 2	Bits	[1864]
Number of Code Blocks per slot		1
Binary Channel Bits Per slot		
For slots with RMSI Note 2	Bits	[6048]
Note 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block. Note 2: PDSCH is scheduled on the slots with RMSI. Note 3: If necessary, the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in 3GPP TS 38.213 [8]. Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1. Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in section A.3.10.		

Table A.1.1.2-3: PDSCH Reference Measurement Channels for SCS = 120 kHz for TDD

Parameter	Unit	Value
Reference channel		SR.3.1 TDD
Channel bandwidth	MHz	100
Number of transmitter antennas		1
Allocated resource blocks for PDSCH Note 1		24
Allocated slots per Radio Frame		TBD
Radio frame containing SSB	slots	Note 5
Radio frame not containing SSB	slots	[48]
MCS table		64QAM
MCS index		4
Modulation		QPSK
Target Coding Rate		1/3
Number of control symbols		2
PDSCH mapping type		Type A
Information Bit Payload		
For slots with RMSI Note 2	Bits	[1864]
Number of Code Blocks per slot		1
Binary Channel Bits Per slot		
For slots with RMSI Note 2, 4	Bits	[6048]
Note 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block. Note 2: PDSCH is scheduled on the slots with RMSI. Note 3: If necessary, the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in 3GPP TS 38.213 [8]. Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1. Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in section A.3.10.		

A.1.2 CORESET for RMSI scheduling

A.1.2.1 FDD

Table A.1.2.1-1: RMSI CORESET Reference Measurement Channels for SCS = 15 kHz for FDD

Parameter	Unit	Value
Reference channel		CR.1.1 FDD
Channel bandwidth	MHz	10
Subcarrier spacing for RMSI CORESET	kHz	15
Allocated resource blocks for RMSI CORESET Note 7		24
Subcarrier spacing for SSB	kHz	15
SSB and RMSI CORESET multiplexing configuration		Pattern 1
Offset between SSB and RMSI CORESET Note 3, 7	RB	0 (Note 8)
Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4		Index 4
Number of transmitter antennas		1
Duration of RMSI CORESET Note 7	symbols	2
DCI Format Note 1		Note 2
Aggregation level	CCE	8
DMRS precoder granularity		6
REG bundle size		6
Mapping from REG to CCE		Distributed
Cell ID		Note 5
Payload (without CRC)	Bits	Note 6

Note 1: DCI formats are defined in TS 38.212 [7].
Note 2: DCI format shall depend upon the test configuration.
Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [8].
Note 5: Cell ID shall depend upon the test configuration.
Note 6: Payload size shall depend upon the test configuration.
Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-1 in TS 38.213 [8].
Note 8: Other values can be used to align with GSCN as long as SSB does not overlap the RMC

A.1.2.2 TDD

Table A.1.2.2-1: RMSI CORESET Reference Measurement Channels for SCS = 15 kHz for TDD

Parameter	Unit	Value
Reference channel		CR.1.1 TDD
Channel bandwidth	MHz	10
Subcarrier spacing for RMSI CORESET	kHz	15
Allocated resource blocks for RMSI CORESET Note 7		24
Subcarrier spacing for SSB	kHz	15
Index of transmited SSB within an SS-Burst		#0
SSB and RMSI CORESET multiplexing configuration		Pattern 1
Offset between SSB and RMSI CORESET Note 3, 7	RB	0 (Note 8)
Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4		Index 4
Number of transmitter antennas		1
Duration of RMSI CORESET Note 7	symbols	2
DCI Format Note 1		Note 2
Aggregation level	CCE	8
DMRS precoder granularity		6
REG bundle size		6
Mapping from REG to CCE		Distributed
Cell ID		Note 5
Payload (without CRC)	Bits	Note 6
Note 1: DCI formats are defined in TS 38.212 [7]. Note 2: DCI format shall depend upon the test configuration. Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block. Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [8]. Note 5: Cell ID shall depend upon the test configuration. Note 6: Payload size shall depend upon the test configuration. Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-1 in TS 38.213 [8]. Note 8: Other values can be used to align with GSCN as long as SSB does not overlap the RMC		

Table A.1.2.2-2: RMSI CORESET Reference Measurement Channels for SCS = 30 kHz for TDD

Parameter	Unit	Value
Reference channel		CR.2.1 TDD
Channel bandwidth	MHz	40
Subcarrier spacing for RMSI CORESET	kHz	30
Allocated resource blocks for RMSI CORESET Note 7		24
Index of transmited SSB within an SS-Burst		#0
Index of transmited SSB within an SS-Burst		#0
SSB and RMSI CORESET multiplexing configuration		Pattern 1
Offset between SSB and RMSI CORESET Note 3, 7	RB	0 (Note 8)
Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4		Index 4
Number of transmitter antennas		1
Duration of RMSI CORESET Note 7	symbols	2
DCI Format Note 1		Note 2
Aggregation level	CCE	8
DMRS precoder granularity		6
REG bundle size		6
Mapping from REG to CCE		Distributed
Cell ID		Note 5
Payload (without CRC)	Bits	Note 6

Note 1: DCI formats are defined in TS 38.212 [7].
Note 2: DCI format shall depend upon the test configuration.
Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [8].
Note 5: Cell ID shall depend upon the test configuration.
Note 6: Payload size shall depend upon the test configuration.
Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-1 in TS 38.213 [8].
Note 8: Other values can be used to align with GSCN as long as SSB does not overlap the RMC

Table A.1.2.2-3: RMSI CORESET Reference Measurement Channels for SCS = 120 kHz for TDD

Parameter	Unit	Value
Reference channel		CR.3.1 TDD
Channel bandwidth	MHz	100
Subcarrier spacing for RMSI CORESET	kHz	120
Allocated resource blocks for RMSI CORESET Note 7		24
Subcarrier spacing for SSB	kHz	120
Index of transmited SSB within an SS-Burst		#0
SSB and RMSI CORESET multiplexing configuration		Pattern 1
Offset between SSB and RMSI CORESET Note 3, 7	RB	0 (Note 8)
Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4		Index 4
Number of transmitter antennas		1
Duration of RMSI CORESET Note 7	symbols	2
DCI Format Note 1		Note 2
Aggregation level	CCE	8
DMRS precoder granularity		6
REG bundle size		6
Mapping from REG to CCE		Distributed
Cell ID		Note 5
Payload (without CRC)	Bits	Note 6

Note 1: DCI formats are defined in TS 38.212 [7].
Note 2: DCI format shall depend upon the test configuration.
Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [8].
Note 5: Cell ID shall depend upon the test configuration.
Note 6: Payload size shall depend upon the test configuration.
Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-1 in TS 38.213 [8].
Note 8: Other values can be used to align with GSCN as long as SSB does not overlap the RMC

A.1.3 CORESET for RMC scheduling

A.1.3.1 FDD

Table A.1.3.1-1: Control Channel RMC for SCS = 15 kHz for FDD

Parameter	Unit	Value
Reference channel		[CCR.1.1] FDD
Channel bandwidth	MHz	10
Subcarrier spacing for RMSI CORESET	kHz	15
Allocated resource blocks for CORESET		24
Number of transmitter antenna		1
Duration of CORESET	symbols	2
REG bundle size		6
DMRS precoder granularity		Same as REG bundle size
CCE to REG mapping		Interleaved
Interleave n_shift		0
Interleave size		2
Beamforming Pre-Coder		N/A
Aggregation level	CCE	8
DCI formats		Note 1
Payload size (without CRC)	bits	Note 2
Note 1: DCI format shall depend upon the test configuration. Note 2: Payload size shall depend upon the test configuration		

A.1.3.2 TDD

Table A.1.3.2-1: Control Channel RMC for SCS = 15 kHz for TDD

Parameter	Unit	Value
Reference channel		[CCR.1.1] TDD
Channel bandwidth	MHz	10
Subcarrier spacing for RMSI CORESET	kHz	15
Allocated resource blocks for CORESET		24
Number of transmitter antenna		1
Duration of CORESET	symbols	2
REG bundle size		6
DMRS precoder granularity		Same as REG bundle size
CCE to REG mapping		Interleaved
Interleave n_shift		0
Interleave size		2
Beamforming Pre-Coder		N/A
Aggregation level	CCE	8
DCI formats		Note 1
Payload size (without CRC)	bits	Note 2
Note 1: DCI format shall depend upon the test configuration. Note 2: Payload size shall depend upon the test configuration		

Table A.1.3.2-2: Control Channel RMC for SCS = 30 kHz for TDD

Parameter	Unit	Value
Reference channel		[CCR.2.1] TDD
Channel bandwidth	MHz	40
Subcarrier spacing for RMSI CORESET	kHz	30
Allocated resource blocks for CORESET		24
Number of transmitter antenna		1
Duration of CORESET	symbols	2
REG bundle size		6
DMRS precoder granularity		Same as REG bundle size
CCE to REG mapping		Interleaved
Interleave n_shift		0
Interleave size		2
Beamforming Pre-Coder		N/A
Aggregation level	CCE	8
DCI formats		Note 1
Payload size (without CRC)	bits	Note 2
Note 1: DCI format shall depend upon the test configuration. Note 2: Payload size shall depend upon the test configuration		

Table A.1.3.2-3: Control Channel RMC for SCS = 120 kHz for TDD

Parameter	Unit	Value
Reference channel		[CCR.3.1] TDD
Channel bandwidth	MHz	100
Subcarrier spacing for RMSI CORESET	kHz	120
Allocated resource blocks for CORESET		24
Number of transmitter antenna		1
Duration of CORESET	symbols	2
REG bundle size		6
DMRS precoder granularity		Same as REG bundle size
CCE to REG mapping		Interleaved
Interleave n_shift		0
Interleave size		2
Beamforming Pre-Coder		N/A
Aggregation level	CCE	8
DCI formats		Note 1
Payload size (without CRC)	bits	Note 2
Note 1: DCI format shall depend upon the test configuration. Note 2: Payload size shall depend upon the test configuration		

A.1.4 CSI-RS

A.1.4.1 FDD

Table A.1.4.1-1: CSI-RS Reference Measurement Channels for SCS = 15 kHz for FDD

Parameter		Unit	Value		
Reference channel			CSI-RS.1.1 FDD	CSI-RS.1.2 FDD	CSI-RS.1.3 FDD
Channel bandwidth		MHz	10	10	10
Subcarrier spacing for RMSI CORESET		kHz	15	15	15
NZP CSI-RS	resourceType		periodic	periodic	periodic
	Number of ports		2	1	1
	CMD Type		FD-CDM2	noCDM	noCDM
	Density		1	3	3
	firstOFDMSymbolInTimeDomain		5	5	5
	frequencyDomainAllocation		000001	000001	000001
	period	slot	TBD	TBD	TBD
	offset	slot	TBD	TBD	TBD
	EPRE ratio to SSS	dB	0	0	0
CSI-IM	subcarrierLocation-p0		s0	N/A	N/A
	symbolLocation-p0		6	N/A	N/A
	period	slot	TBD	N/A	N/A
	offset	slot	TBD	N/A	N/A
ReportConfigType			periodic	periodic	periodic
CQI-table			Table 1	N/A	N/A
reportQuantity			TBD	csi-RSRP	csi-RSRP
timeRestrictionForInterferenceMeasurement			configured	N/A	N/A
cqi-FormatIndicator			Wideband	N/A	N/A
pmi-FormatIndicator			Wideband	N/A	N/A
Codebook Type			Type1 single panel	N/A	N/A
Codebook Mode			1	N/A	N/A
Type1-SinglePanel-2Tx-CodebookSubsetRestriction			111111	N/A	N/A
Physical channel for CSI report			PUCCH	PUCCH	PUCCH
Reporting Interval		ms	10	TBD	TBD
CQI/RI/PMI delay		ms	TBD	N/A	N/A

A.1.4.2 TDD

Table A.1.4.2-1: CSI-RS Reference Measurement Channels for SCS = 15 kHz for TDD

Parameter		Unit	Value		
Reference channel			CSI-RS.1.1 TDD	CSI-RS.1.2 TDD	CSI-RS.1.3 TDD
Channel bandwidth		MHz	10	10	10
Subcarrier spacing for RMSI CORESET		kHz	15	15	15
NZP CSI-RS	resourceType		periodic	periodic	periodic
	Number of ports		2	1	1
	CMD Type		FD-CDM2	noCDM	noCDM
	Density		1	3	3
	firstOFDMSymbolInTimeDomain		5	5	5
	frequencyDomainAllocation		000001	000001	000001
	period	slot	TBD	TBD	TBD
	offset	slot	TBD	TBD	TBD
	EPRE ratio to SSS	dB	0	0	0
CSI-IM	subcarrierLocation-p0		s0	N/A	N/A
	symbolLocation-p0		6	N/A	N/A
	period	slot	TBD	N/A	N/A
	offset	slot	TBD	N/A	N/A
ReportConfigType			periodic	periodic	periodic
CQI-table			Table 1	N/A	N/A
reportQuantity			TBD	csi-RSRP	csi-RSRP
timeRestrictionForInterferenceMeasurement			configured	N/A	N/A
cqi-FormatIndicator			Wideband	N/A	N/A
pmi-FormatIndicator			Wideband	N/A	N/A
Codebook Type			Type1 single panel	N/A	N/A
Codebook Mode			1	N/A	N/A
Type1-SinglePanel-2Tx-CodebookSubsetRestriction			111111	N/A	N/A
Physical channel for CSI report			PUCCH	PUCCH	PUCCH
Reporting Interval		ms	10	TBD	TBD
CQI/RI/PMI delay		ms	TBD	N/A	N/A

Table A.1.4.2-2: CSI-RS Reference Measurement Channels for SCS = 30 kHz for TDD

Parameter		Unit	Value		
Reference channel			CSI-RS.2.1 TDD	CSI-RS.2.2 TDD	CSI-RS.2.3 TDD
Channel bandwidth		MHz	40	40	40
Subcarrier spacing for RMSI CORESET		kHz	30	30	30
NZP CSI-RS	resourceType		periodic	periodic	periodic
	Number of ports		2	1	1
	CMD Type		FD-CDM2	noCDM	noCDM
	Density		1	3	3
	firstOFDMSymbolInTimeDomain		5	5	5
	frequencyDomainAllocation		000001	000001	000001
	period	slot	TBD	TBD	TBD
	offset	slot	TBD	TBD	TBD
	EPRE ratio to SSS	dB	0	0	0
CSI-IM	subcarrierLocation-p0		s0	N/A	N/A
	symbolLocation-p0		6	N/A	N/A
	period	slot	TBD	N/A	N/A
	offset	slot	TBD	N/A	N/A
ReportConfigType			periodic	periodic	periodic
CQI-table			Table 1	N/A	N/A
reportQuantity			TBD	csi-RSRP	csi-RSRP
timeRestrictionForInterferenceMeasurement			configured	N/A	N/A
cqi-FormatIndicator			Wideband	N/A	N/A
pmi-FormatIndicator			Wideband	N/A	N/A
Codebook Type			Type1 single panel	N/A	N/A
Codebook Mode			1	N/A	N/A
Type1-SinglePanel-2Tx-CodebookSubsetRestriction			111111	N/A	N/A
Physical channel for CSI report			PUCCH	PUCCH	PUCCH
Reporting Interval		ms	10	TBD	TBD
CQI/RI/PMI delay		ms	TBD	N/A	N/A

Table A.1.4.2-3: CSI-RS Reference Measurement Channels for SCS = 120 kHz for TDD

Parameter		Unit	Value		
Reference channel			CSI-RS.3.1 TDD	CSI-RS.3.2 TDD	CSI-RS.3.2 TDD
Channel bandwidth		MHz	100	100	100
Subcarrier spacing for RMSI CORESET		kHz	120	120	120
NZP CSI-RS	resourceType		periodic	periodic	periodic
	Number of ports		2	1	1
	CMD Type		FD-CDM2	noCDM	noCDM
	Density		1	3	3
	firstOFDMSymbolInTimeDomain		5	5	5
	frequencyDomainAllocation		000001	000001	000001
	period	slot	TBD	TBD	TBD
	offset	slot	TBD	TBD	TBD
	EPRE ratio to SSS	dB	0	0	0
CSI-IM	subcarrierLocation-p0		s0	N/A	N/A
	symbolLocation-p0		6	N/A	N/A
	period	slot	TBD	N/A	N/A
	offset	slot	TBD	N/A	N/A
ReportConfigType			periodic	periodic	periodic
CQI-table			Table 1	N/A	N/A
reportQuantity			TBD	csi-RSRP	csi-RSRP
timeRestrictionForInterferenceMeasurement			configured	N/A	N/A
cqi-FormatIndicator			Wideband	N/A	N/A
pmi-FormatIndicator			Wideband	N/A	N/A
Codebook Type			Type1 single panel	N/A	N/A
Codebook Mode			1	N/A	N/A
Type1-SinglePanel-2Tx-CodebookSubsetRestriction			111111	N/A	N/A
Physical channel for CSI report			PUCCH	PUCCH	PUCCH
Reporting Interval		ms	10	TBD	TBD
CQI/RI/PMI delay		ms	TBD	N/A	N/A

A.1.5 TDD UL/DL configuration

Table A.1.5-1: TDD UL/DL configuration for SCS=15kHz

Parameter	Unit	Value		
Reference channel		TDDConf.1.1		
referenceSubcarrierSpacing	kHz	15		
TDD UL/DL pattern 1 Note 2		'DSUU' S='10DL:2GP:2UL'		
dl-UL-TransmissionPeriodicity	ms	4		
nrofDownlinkSlots		1		
nrofDownlinkSymbols		9		
nrofUplinkSlot		2		
nrofUplinkSymbols		2		
TDD UL/DL pattern 2 Note 2		'D'		
dl-UL-TransmissionPeriodicity	ms	1		
nrofDownlinkSlots		1		
nrofDownlinkSymbols		0		
nrofUplinkSlot		0		
nrofUplinkSymbols		0		
Note 1: As specified in TS 38.213 [8] and TS 38.331 [13]. Note 2: For information				

Table A.1.5-2: TDD UL/DL configuration for SCS=30kHz

Parameter	Unit	Value		
Reference channel		TDDConf.2.1		
referenceSubcarrierSpacing	kHz	30		
TDD UL/DL pattern 1 Note 2		'3D1S4U' S='6DL:4GP:4UL'		
dl-UL-TransmissionPeriodicity	ms	4		
nrofDownlinkSlots		3		
nrofDownlinkSymbols		4		
nrofUplinkSlot		4		
nrofUplinkSymbols		4		
TDD UL/DL pattern 2 Note 2		'DD'		
dl-UL-TransmissionPeriodicity	ms	1		
nrofDownlinkSlots		2		
nrofDownlinkSymbols		0		
nrofUplinkSlot		0		
nrofUplinkSymbols		0		
Note 1: As specified in TS 38.213 [8] and TS 38.331 [13]. Note 2: For information				

Table A.1.5-3: TDD UL/DL configuration for SCS=120kHz

Parameter	Unit	Value		
Reference channel		TDDConf.3.1		
referenceSubcarrierSpacing	kHz	120		
TDD UL/DL pattern 1 Note 2		'DDDSU' S='10DL:2GP:2UL'		
dl-UL-TransmissionPeriodicity	ms	0.625		
nrofDownlinkSlots		3		
nrofDownlinkSymbols		9		
nrofUplinkSlot		1		
nrofUplinkSymbols		2		
TDD UL/DL pattern 2 Note 2		Not configured		
dl-UL-TransmissionPeriodicity	ms	Not configured		
nrofDownlinkSlots		Not configured		
nrofDownlinkSymbols		Not configured		
nrofUplinkSlot		Not configured		
nrofUplinkSymbols		Not configured		
Note 1: As specified in TS 38.213 [8] and TS 38.331 [13]. Note 2: For information				

A.1.6 PUSCH

This rule applies to NR cell(s), which the UE is connected to. The UE is in RRC_CONNECTED mode.

When signalling or data payloads are expected to be sent on the PUSCH, the UE may be provided in advance with PUSCH resources by the SS. For sake of simplicity, the PUSCH scheduling may also occur continuously over many consecutive subframes. These options shall not be used if:
1) stated otherwise in the test description, or
2) the transmission of PUSCH and UL scheduling information affects the test purpose (e.g. DRX, PUCCH reception etc.)

A.2 Reference OCGN configuration

A.2.1 Generic OFDMA channel noise generator (OCGN)

The OCGN pattern is used in a test for modelling the allocation of unused resourced in the channel bandwidth to virtual UEs (UEs that are not under test). The OCNG pattern simulates both PDCCH and PDSCH transmissions to the virtual UEs.

Table A.2.1-1: OP.1: Generic OCNG pattern for all unused REs

OCNG Parameters	Control Region	Data Region
Resource allocation	Unused REs (Note 1)	Unused REs (Note 2)
Channel	PDCCH	PDSCH
Contents	Virtual UE IDs	Uncorrelated pseudo random QPSK modulated data
Antenna transmission scheme	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Subcarrier spacing	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Aggregation level	Same as used in PDCCH RMC	N/A
Code rate	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Transmit Power	Same as used in PDCCH RMC	Same as used in PDSCH RMC
CP length	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Note 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test. Note 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the channel bandwidth of the cell.		

A.3 Reference SSB configuration

A.3.1 SSB configuration for FR1

Table A.3.1-1: SSB allocation for FR1

SMTC Parameters	Unit	Value					
SSB Pattern		SSB.1 FR1	SSB.2 FR1	SSB.3 FR1		SSB.4 FR1	
Channel bandwidth	MHz	10	40	10		40	
SSB SCS	kHz	15	30	15		30	
SSB periodicity	ms	20	20	20		20	
Number of SSBs per SS-burst		1	1	2		2	
SS/PBCH block index		0	0	0	1	0	1
Indices of symbols containing SSB		2-5	4-7	2-5	8-11	2-5	8-11
Indices of slots containing SSB		0	0	-		-	
RB numbers containing SSB within channel BW		(RB_J, RB_{J+1},…., RB_{J+19})$^{Note 1}$	(RB_J, RB_{J+1},…., RB_{J+19})$^{Note 1}$	0-19		0-19	
Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [xx]. Editor's note: spec is not listed!							

A.3.2 SSB configuration for FR2

Table A.3.2-1: SSB allocation for FR2

SMTC Parameters	Unit	Value					
SSB Pattern		SSB.1 FR2		SSB.2 FR2		SSB.3 FR2	SSB.4 FR2
Channel bandwidth	MHz	100		100		100	100
SSB SCS	kHz	120		240		120	240
SSB periodicity	ms	20		20		20	20
Number of SSBs per SS-burst		2		2		1	1
SS/PBCH block index		0	1	0	1	0	0
Indices of symbols containing SSB		4-7	8-11	8-11	12-13, 0-1	4-7	8-11
Indices of slots containing SSB		0		0		0	0
RB numbers containing SSB within channel BW		$(RB_J, RB_{J+1},...., RB_{J+19})$ Note 1		$(RB_J, RB_{J+1},...., RB_{J+19})$ Note 1		$(RB_J, RB_{J+1},...., RB_{J+19})$ Note 1	$(RB_J, RB_{J+1},...., RB_{J+19})$ Note 1
Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [xx]. Editor's note: spec is not listed!							

A.4 Reference SMTC configuration

Table A.4-1: SMTC configurations

SSB Parameters	Unit	Value		
SMTC Pattern		SMTC.1	SMTC.2	SMTC.3
SMTC periodicity	MHz	20	20	160
SMTC offset	ms	0	0	0
SMTC duration	ms	1	5	1

A.5 Reference DRX configurations

Table A.5-1: DRX configurations

Parameter	Unit	Value							
DRX Configuration		DRX.1	DRX.2	DRX.3	DRX.4	DRX.5	DRX.6	DRX.7	DRX.8
drx-onDurationTimer	ms	1	1	1	psf2	psf6	1	6	6
drx-InactivityTimer	ms	1	1	1	psf2	psf1920	1	1	1
drx-RetransmissionTimerDL	slot	1	1	1	psf16	psf16	1	1	1
drx-RetransmissionTimerUL	slot	1	1	1			1	1	1
drx-LongCycleStartOffset	ms	40	640	40	sf160, 0	sf320. 0	640	640	320
shortDRX	-	disabled	disabled	disabled	disabled	disabled	disabled	disabled	disabled
TimeAlignmentTimer	ms	500	500	Infinity	Infinity	Infinity	500	Infinity	Infinity
Note 1: The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [13]									

A.6 EN-DC test setup

The purpose of this Annex is to specify the EN-DC configuration for the test cases in Chapters 4 and 5 of this test specification.

A.6.1 E-UTRA serving cell parameters

This section defines the cell power levels and other specific cell parameters of the E-UTRA serving cell for EN-DC.

A.6.1.1 E-UTRA serving cell parameters for EN-DC tests with NR FR1

Table A.6.1.1-1 defines the E-UTRA serving cell parameters for EN-DC tests with NR FR1 cell(s), defined in Chapter 4 of this test specification.

Table A.6.1.1-1: E-UTRAN cell specific test parameters for EN-DC tests with NR FR1

Parameter	Unit	E-UTRAN Cell1
E-UTRA RF Channel Number		1
Duplex mode		FDD or TDD
TDD special subframe configuration[Note1]		6
TDD uplink-downlink configuration[Note1]		1
$BW_{channel}$		5MHz: $N_{RB,c}$ = 25 10MHz: $N_{RB,c}$ = 50 20MHz: $N_{RB,c}$ = 100
PDSCH parameters: DL Reference Measurement Channel[Note2]		5MHz: R.7 FDD 10MHz: R.3 FDD 20MHz: R.6 FDD 5MHz: R.4 TDD 10MHz: R.0 TDD 20MHz: R.3 TDD
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2]		5MHz: R.11 FDD 10MHz: R.6 FDD 20MHz: R.10 FDD 5MHz: R.11 TDD 10MHz: R.6 TDD 20MHz: R.10 TDD
OCNG Patterns[Note2]		5MHz: OP.20 FDD 10MHz: OP.10 FDD 20MHz: OP.17 FDD 5MHz: OP.9 TDD 10MHz: OP.1 TDD 20MHz: OP.7 TDD
PBCH_RA	dB	0
PBCH_RB	dB	
PSS_RA	dB	
SSS_RA	dB	
PCFICH_RB	dB	
PHICH_RA	dB	
PHICH_RB	dB	
PDCCH_RA	dB	
PDCCH_RB	dB	
PDSCH_RA	dB	
PDSCH_RB	dB	
OCNG_RA[Note3]	dB	
OCNG_RB[Note3]	dB	
N_{oc}[Note4]	dBm/15 kHz	-104
$\hat{E}_s/N_{oc}$	dB	17
$\hat{E}_s/I_{ot}$	dB	17
RSRP [Note5]	dBm/15 kHz	-87
SCH_RP [Note5]	dBm/15 kHz	-87
Io [Note5]	dBm/Ch BW	-59.13 + 10log($N_{RB,c}$ /50)
Propagation Condition		AWGN
Antenna Configuration		1x2

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in sections A.1, A.2 and D.1 of TS 36.521-3 [26].
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 5: Es/Iot, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

A.6.1.2 E-UTRA serving cell parameters for EN-DC tests with NR FR2

Table A.6.1.2-1 defines the E-UTRA serving cell parameters for EN-DC tests with NR FR2 cell(s), defined in Chapter 5 of this test specification.

Table A.6.1.2-1: E-UTRAN cell specific test parameters for EN-DC tests with NR FR2

Parameter	Unit	E-UTRAN Cell1
E-UTRA RF Channel Number		1
Duplex mode		FDD or TDD
TDD special subframe configuration[Note1]		6
TDD uplink-downlink configuration[Note1]		1
$BW_{channel}$	MHz	5MHz: $N_{RB,c}$ = 25 10MHz: $N_{RB,c}$ = 50 20MHz: $N_{RB,c}$ = 100
PDSCH parameters: DL Reference Measurement Channel[Note2]		5MHz: R.7 FDD 10MHz: R.3 FDD 20MHz: R.6 FDD 5MHz: R.4 TDD 10MHz: R.0 TDD 20MHz: R.3 TDD
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2]		5MHz: R.11 FDD 10MHz: R.6 FDD 20MHz: R.10 FDD 5MHz: R.11 TDD 10MHz: R.6 TDD 20MHz: R.10 TDD
OCNG Patterns[Note2]		5MHz: OP.20 FDD 10MHz: OP.10 FDD 20MHz: OP.17 FDD 5MHz: OP.9 TDD 10MHz: OP.1 TDD 20MHz: OP.7 TDD
PBCH_RA	dB	0
PBCH_RB	dB	
PSS_RA	dB	
SSS_RA	dB	
PCFICH_RB	dB	
PHICH_RA	dB	
PHICH_RB	dB	
PDCCH_RA	dB	
PDCCH_RB	dB	
PDSCH_RA	dB	
PDSCH_RB	dB	
OCNG_RA[Note3]	dB	
OCNG_RB[Note3]	dB	
Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24]. Note 2: DL RMCs and OCNG patterns are specified in sections A 1, A.2 and D.1 of TS 36.521-3 [26]. Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 4: The E-UTRA signal is required only to ensure the E-UTRA link to the DUT in the EN-DC operation. The Test System shall provide a stable and noise-free E-UTRA signal without need of precise propagation modelling, path loss and polarization control. Further details of the E-UTRA signal configuration are not defined as part of the cell specific test parameters, since the E-UTRA link is not under performance verification and is not expected to influence the NR FR2 requirement.		

A.7 Reference PRACH configurations

This section provides the typical PRACH configurations used for all RRM test cases defined in this test specification. Parameters not listed in this section can be derived from the configuration of each test.

A.7.1 PRACH configurations for FR1

Table A.7.1-1 defines the PRACH configurations for FR1. Each of the PRACH configurations defined in Table A.7.1-1 have different applicabilities:

- PRACH.1 FR1 for SSB-based contention based random access in FR1.
- PRACH.2 FR1 for SSB-based non-contention based random access in FR1.
- PRACH.3 FR1 for CSI-RS based non-contention based random access in FR1.

Table A.7.1-1 Parameters for PRACH Configurations for FR1

Field	Value			Comment
PRACH Configuration	PRACH.1 FR1	PRACH.2 FR1	PRACH.3 FR1	
prach-ConfigurationIndex	87	87	87	160ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 in TS 38.211 [7].
msg1-SubcarrierSpacing	Same as UL carrier SCS	Same as UL carrier SCS	Same as UL carrier SCS	
totalNumberOfRA-Preambles	48	48	48	Total number of preambles used for contention based and contention free random acces
numberOfRA-PreamblesGroupA	48	48	48	No group B.
prach-RootSequenceIndex	0	0	0	Logic equence index = 0, resulting in root sequence = 1.
ssb-perRACH-OccasionAndCB-PreamblesPerSSB	oneFourth, n48	-	-	OneFourth: 1 SSB associated with 4 RACH occasions n48: 48 contention based preambles per SSB
ssb-perRACH-Occasion	-	oneFourth	oneFourth	OneFourth: 1 SSB associated with 4 RACH occasions
msg1-FDM	One	One	One	One PRACH transmission occasions FDMed in one time instance.
rsrp-ThresholdSSB	RSRP_51	RSRP_51	N/A	-106dBm≤ *rsrp-ThresholdSSB* <-105dBm
rsrp-ThresholdCSI-RS	N/A	N/A	RSRP_51	
ra-ContentionResolutionTimer	sf48	-	-	48 sub-frames
powerRampingStep	dB2	dB2	dB2	
preambleReceivedTargetPower	dBm-120	dBm-120	dBm-120	
preambleTransMax	n6	n6	n6	Max number of RA preamble transmission perfomed before declaring a failure is 6
ra-ResponseWindow	sl10	sl10	sl10	10 slots
zeroCorrelationZoneConfig	11	11	11	N-CS configuration, N_{CS} = 23
Backoff Parameter Index	2	2	2	20ms, as defined in table 7.2-1 in TS 38.321 [12].
ssb-ResourceList	-	present	N/A	Assocated with SSB index 0
ra-PreambleIndex	-	50	N/A	Assocated with SSB index 0
csirs-ResourceList	N/A	N/A	present	Assocated with CSI-RS configured
ra-PreambleIndex	N/A	N/A	50	Assocated with CSI-RS configured
ra-OccasionList	-	-	1	RA occasions allowed corresponding to CSI-RS
ra-ssb-OccasionMaskIndex	-	1	N/A	PRACH occasion index 1 is allowed
Note: For further information see Clause 6.3.2 in TS 38.331 [13].				

A.7.2 PRACH configurations for FR2

Table A.7.2-1 defines the PRACH configurations for FR2. Each of the PRACH configurations defined in Table A.7.2-1 have different applicabilities:

- PRACH.1 FR2 for SSB-based contention based random access in FR2.
- PRACH.2 FR2 for SSB-based non-contention based random access in FR2.

- PRACH.3 FR2 for CSI-RS based non-contention based random access in FR2.

Table A.7.2-1 Parameters for PRACH Configurations for FR2

Field	Value			Comment
PRACH Configuration	PRACH.1 FR2	PRACH.2 FR2	PRACH.3 FR2	
prach-ConfigurationIndex	236	236	236	160ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 in TS 38.211 [7].
msg1-SubcarrierSpacing	Same as UL carrier SCS	Same as UL carrier SCS	Same as UL carrier SCS	
totalNumberOfRA-Preambles	48	48	48	Total number of preambles used for contention based and contention free random acces
numberOfRA-PreamblesGroupA	48	48	48	No group B.
prach-RootSequenceIndex	0	0	0	Logic equence index = 0, resulting in root sequence = 1.
ssb-perRACH-OccasionAndCB-PreamblesPerSSB	oneFourth, n48	N/A	N/A	OneFourth: 1 SSB associated with 4 RACH occasions n48: 48 contention based preambles per SSB
ssb-perRACH-Occasion	N/A	oneFourth	oneFourth	OneFourth: 1 SSB associated with 4 RACH occasions
msg1-FDM	One	One	One	One PRACH transmission occasions FDMed in one time instance.
rsrp-ThresholdSSB	RSRP_51	RSRP_51	N/A	-106dBm≤ *rsrp-ThresholdSSB* <-105dBm
rsrp-ThresholdCSI-RS	N/A	N/A	RSRP_51	
ra-ContentionResolutionTimer	sf48	N/A	N/A	48 sub-frames
powerRampingStep	dB2	dB2	dB2	
preambleReceivedTargetPower	dBm-120	dBm-120	dBm-120	
preambleTransMax	n6	n6	n6	Max number of RA preamble transmission perfomed before declaring a failure is 6
ra-ResponseWindow	sl10	sl10	sl10	10 slots
zeroCorrelationZoneConfig	11	11	11	N-CS configuration, N_{CS} = 23
Backoff Parameter Index	2	2	2	20ms, as defined in table 7.2-1 in TS 38.321 [12].
ssb-ResourceList	-	present	N/A	Assocated with SSB index 0
ra-PreambleIndex	-	50	N/A	Assocated with SSB index 0
csirs-ResourceList	N/A	N/A	present	Assocated with CSI-RS configured
ra-PreambleIndex	N/A	N/A	50	Assocated with CSI-RS configured
ra-OccasionList	-	-	1	RA occasions allowed corresponding to CSI-RS
ra-ssb-OccasionMaskIndex	-	1	N/A	PRACH occasion index 1 is allowed
Note: For further information see Clause 6.3.2 in TS 38.331 [13].				

A.8 Reference BWP configurations

This section provides the typical BWP configurations used for RRM test cases defined in this test specification. For downlink BWP, both initial BWP and dedicated BWP configurations are specified in section A.8.1 and for uplink BWP, dedicated BWP configurations are specified in section A.8.2. Parameters not listed in this section can be derived from the configuration of each test.

A.8.1 Downlink BWP configurations

Table A.8.1-1 defines the different downlink initial BWP configurations. Table A.8.1-2 defines the different downlink dedicated BWP configurations.

Table A.8.1-1: Downlink initial BWP configurations

BWP Parameters	Unit	Values		
DL BWP		**DLBWP.0.1**	**DLBWP.0.2**	
Starting PRB index		0	RB_a Note 1	
Bandwidth		Same as RF channel defined in each test	same as RMSI CORSET(CORSET #0) defined in each test	
Note 1: RB_a is the lowest PRB index to guarantee the BWP including SSB PRB index (RBJ, RBJ+1,…., RBJ+19) which is defined in Section A.3.				

Table A.8.1-2: Downlink dedicated BWP configurations

BWP Parameters	Unit	Values						
DL BWP		**DLBWP.1.1**	**DLBWP.1.2**			**DLBWP.1.3**		
Starting PRB index		0	RB_b Note 1			RB_a Note 2		
SCS	KHz		15	30	120	15	30	120
Bandwidth	RB	Same as RF channel defined for the serving cell in each test	25	51	32	15	51	32
Note 1: RB_b is the lowest PRB index to guarantee the BWP not fully overlapped with SSB PRB index (RBJ, RBJ+1,…., RBJ+19) which is defined in Section A.3. Note 2: RB_a is the lowest PRB index to guarantee the BWP including SSB PRB index (RBJ, RBJ+1,…., RBJ+19) which is defined in Section A.3.								

A.8.2 Uplink BWP configurations

Table A.8.2-1 defines the uplink initial BWP configurations. Table A.8.2-2 defines the uplink dedicated BWP configurations.

Table A.8.2-1: Uplink BWP patterns for initial BWP configurations

BWP Parameters	Values	
UL BWP	**ULBWP.0.1**	**ULBWP.0.2**
Staring PRB index	0	RB_a Note 1
Bandwidth	Same as RF channel defined in each test	same as RMSI CORSET(CORSET #0) defined in each test
Note 1: RBa is the lowest PRB index to guarantee the BWP including SSB PRB index (RBJ, RBJ+1,…., RBJ+19) which is defined in Section A.3.		

Table A.8.2-2: Uplink BWP patterns for initial BWP configurations

BWP Parameters	Unit	Values						
UL BWP		ULBWP.1.1	ULBWP.1.2			ULBWP.1.3		
Staring PRB index		0	RB_b Note 1			RB_a Note 1		
SCS	KHz		15	30	120	15	30	120
Bandwidth	RB	Same as RF channel defined for the serving cell in each test	25	51	32	15	51	32
Note 1: RB_b is the lowest PRB index to guarantee the BWP not fully overlapped with SSB PRB index (RBJ, RBJ+1,…., RBJ+19) which is defined in Section A.3. Note 2: RB_a is the lowest PRB index to guarantee the BWP including SSB PRB index (RBJ, RBJ+1,…., RBJ+19) which is defined in Section A.3.								

Annex B (normative): Conditions for RRM requirements applicability for operating bands

B.1 Conditions for NR RRC_IDLE state mobility

B.1.1 Introduction

In Annex B.1, the following conditions are specified:

- UE conditions which shall apply for UE intra-frequency idle state mobility test cases in clauses 6.1 and 7.1,
- UE conditions which shall apply for UE inter-frequency idle state mobility test cases in clauses 6.1 and 7.1.

B.1.2 Conditions for measurements on NR intra-frequency cells for cell re-selection

This section defines the following conditions for NR intra-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.1.2-1 for FR1 NR cells.

The conditions are defined in Table B.1.2-2 for FR2 NR cells.

Table B.1.2-1: Conditions for intra-frequency cell re-selection in FR1

Parameter	NR operating band groups [Note1]	Minimum SSB_RP dBm / SCS_{SSB}		SSB Ês/Iot
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	dB
Conditions	NR_FDD_FR1_A, NR_TDD_FR1_A	-124	-121	≥ -4
	NR_FDD_FR1_B	-123.5	-120.5	
	NR_TDD_FR1_C	-123	-120	
	NR_FDD_FR1_D, NR_TDD_FR1_D	-122.5	-119.5	
	NR_FDD_FR1_E, NR_TDD_FR1_E	-122	-119	
	NR_FDD_FR1_G	-121	-118	
	NR_FDD_FR1_H	-120.5	-117.5	
NOTE 1: NR operating band groups are defined in Section 3.5.2.				

Table B.1.2-2: Conditions for intra-frequency cell re-selection in FR2

Parameter	NR operating band groups [Note1]	Minimum SSB_RP dBm / SCS_{SSB}		SSB Ês/Iot
		SCS_{SSB} = 120 kHz	SCS_{SSB} = 240 kHz	dB
Conditions	NR_TDD_FR2_A	TBD	TBD	TBD
	NR_TDD_FR2_B	TBD	TBD	
	NR_TDD_FR2_F	TBD	TBD	
	NR_TDD_FR2_G	TBD	TBD	
	NR_TDD_FR2_T	TBD	TBD	
	NR_TDD_FR2_Y	TBD	TBD	
NOTE 1: NR operating band groups are defined in Section 3.5.3.				

B.1.3 Conditions for measurements on NR inter-frequency cells for cell re-selection

This section defines the following conditions for NR inter-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions defined in Table B.1.2-1 for FR1 NR intra-frequency cell re-selection shall also apply for FR1 NR inter-frequency cells in this section.

The conditions defined in Table B.1.2-2 for FR2 NR intra-frequency cell re-selection shall also apply for FR2 NR inter-frequency cells in this section.

B.2 Conditions for NR RRC_CONNECTED state

B.2.1 Introduction

In Annex B.2, the following conditions are specified:

- UE conditions which shall apply for UE intra-frequency measurement procedures and measurement performance tests in clauses 4.6, 4.7, 5.6, 5.7, 6.6, 6.7, 7.6 and 7.7,

  UE conditions which shall apply for UE inter-frequency measurements procedures and requirements in Section 9,

- UE conditions which shall apply for UE intra-frequency measurements performance requirements in Section 10,

- UE conditions which shall apply for UE inter-frequency measurements performance requirements in Section 10.

B.2.2 Conditions for NR intra-frequency measurements

This section defines the following conditions for NR intra-frequency measurements and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.2-1 for FR1 NR cells.

The conditions are defined in Table B.2.2-2 for FR2 NR cells.

Table B.2.2-1: Conditions for intra-frequency measurements in FR1

Parameter	NR operating band groups Note1	Minimum SSB_RP		SSB Ês/Iot
		dBm / SCS_{SSB}		dB
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	
Conditions	NR_FDD_FR1_A, NR_TDD_FR1_A	-127	-124	≥ -6
	NR_FDD_FR1_B	-126.5	-123.5	
	NR_TDD_FR1_C	-126	-123	
	NR_FDD_FR1_D, NR_TDD_FR1_D	-125.5	-122.5	
	NR_FDD_FR1_E, NR_TDD_FR1_E	-125	-122	
	NR_FDD_FR1_G	-124	-121	
	NR_FDD_FR1_H	-123.5	-120.5	
NOTE 1: NR operating band groups are defined in Section 3.5.2.				

Table B.2.2-2: Conditions for intra-frequency measurements in FR2

Parameter	NR operating band groups Note1	Minimum SSB_RP dBm / SCS_{SSB}		SSB Ês/Iot dB
		SCS_{SSB} = 120 kHz	SCS_{SSB} = 240 kHz	
Conditions	NR_TDD_FR2_A	TBD	TBD	TBD
	NR_TDD_FR2_B	TBD	TBD	
	NR_TDD_FR2_F	TBD	TBD	
	NR_TDD_FR2_G	TBD	TBD	
	NR_TDD_FR2_T	TBD	TBD	
	NR_TDD_FR2_Y	TBD	TBD	
NOTE 1: NR operating band groups are defined in Section 3.5.3.				

B.2.3 Conditions for NR inter-frequency measurements

This section defines the following conditions for NR inter-frequency measurements and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.3-1 for FR1 NR cells.

The conditions are defined in Table B.2.3-2 for FR2 NR cells.

Table B.2.3-1: Conditions for inter-frequency measurements in FR1

Parameter	NR operating band groups Note1	Minimum SSB_RP dBm / SCS_{SSB}		SSB Ês/Iot dB
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	
Conditions	NR_FDD_FR1_A, NR_TDD_FR1_A	-125	-122	≥ -4
	NR_FDD_FR1_B	-124.5	-121.5	
	NR_TDD_FR1_C	-124	-121	
	NR_FDD_FR1_D, NR_TDD_FR1_D	-124.5	-120.5	
	NR_FDD_FR1_E, NR_TDD_FR1_E	-123	-120	
	NR_FDD_FR1_G	-122	-119	
	NR_FDD_FR1_H	-121.5	-118.5	
NOTE 1: NR operating band groups are defined in Section 3.5.2.				

Table B.2.3-2: Conditions for inter-frequency measurements in FR2

Parameter	NR operating band groups Note1	Minimum SSB_RP dBm / SCS_{SSB}		SSB Ês/Iot dB
		SCS_{SSB} = 120 kHz	SCS_{SSB} = 240 kHz	
Conditions	NR_TDD_FR2_A	TBD	TBD	TBD
	NR_TDD_FR2_B	TBD	TBD	
	NR_TDD_FR2_F	TBD	TBD	
	NR_TDD_FR2_G	TBD	TBD	
	NR_TDD_FR2_T	TBD	TBD	
	NR_TDD_FR2_Y	TBD	TBD	
NOTE 1: NR operating band groups are defined in Section 3.5.3.				

B.3 RRM requirement exceptions

B.3.1 Introduction

Annex B.3 covers exceptions for the side conditions based on receiver sensitivity for CA, DC, and SUL.

B.3.2 Receiver sensitivity relaxation for CA

B.3.2.1 Receiver sensitivity relaxation for UE supporting CA in FR1

For a UE supporting inter-band carrier aggregation configuration with uplink in NR band, if there is a relaxation of receiver sensitivity $\Delta R_{IB,c}$>0 dB as defined in TS 38.101-1 [18, Section 7.3A.3], the relevant side conditions specifying received power levels (SSB_RP and Io) shall be increased by the amount $\Delta=\Delta R_{IB,c}$ defined for the corresponding downlink NR bands.

For a UE supporting CA configuration in FR1, the requirement in this section applies for both SC and CA operation.

B.3.2.2 Receiver sensitivity relaxation for UE configured with CA in FR1

B.3.2.2.1 Inter-band carrier aggregation

For a UE configured with inter-band carrier aggregation with active uplink in NR band, if there is a relaxation of receiver sensitivity $\Delta R_{IB,c}$>0 dB as defined in TS 38.101-1, Section 7.3A.3 [2], the relevant side conditions specifying received power levels (SSB_RP and Io) shall be increased by the amount $\Delta=\Delta R_{IB,c}$ defined for the corresponding downlink NR bands.

If the relaxation Δ specified in this section applies, then the relaxation specified in Section B.3.2.1 should not be applied.

B.3.2.2.2 Reference sensitivity exceptions due to UL harmonic interference for CA

In this section, requirements exceptions are described for the UE configured with a band in FR1 when it is impacted by UL harmonic interference from another band in FR1 of the same CA configuration.

A relevant side condition (SSB_RP and Io) in a requirement shall be increased by the amount Δ=L2-L1, where L1 is the reference sensitivity level specified in TS 38.101-1 [2], Section 7.3.2, and L2 is the reference sensitivity level based on the requirements in TS 38.101-1 [2], Section 7.3A.4, when the following conditions are fulfilled,

- corresponding downlink component carriers on different NR bands are configured with CA and active,
- the upling is configured in the NR low operating band and is active,
- the uplink configuration is as specified in TS 38.101-1 [2], Section 7.3A.4, and
- the exception requirements specified in TS 38.101-1 [2], Section 7.3A.4 apply.

If the relaxation Δ specified in this section applies, then the relaxation specified in Section B.3.2.1 should not be applied.

B.3.2.2.3 Reference sensitivity exceptions due to intermodulation interference due to 2UL CA

In this section, requirements exceptions are described for the UE with an inter-band carrier aggregation with uplink assigned to two NR bands.

A relevant side condition (SSB_RP and Io) in a requirement shall be increased by the amount Δ=L2-L1, where L1 is the reference sensitivity level specified in TS 38.101-1 [2], Section 7.3.2, and L2 is the reference sensitivity level based on the requirements in TS 38.101-1 [2], Section 7.3A.5, when the following conditions are fulfilled,

- corresponding downlink component carriers on different bands are configured with CA and active,
- uplinks are assigned to two NR bands,
- the exception requirements specified in TS 38.101-1 [2], Section 7.3A.5 apply.

If the relaxation Δ specified in this section applies, then the relaxation specified in Section B.3.2.1 should not be applied.

B.3.2.3 Receiver sensitivity relaxation for UE supporting CA in FR2

Editor's note: TBD

B.3.2.4 Receiver sensitivity relaxation for UE configured with CA in FR2

B.3.2.4.1 Intra-band contiguous carrier aggregation

For a UE configured with intra-band contiguous carrier aggregation in NR band in FR2, if there is a relaxation of receiver sensitivity ΔR_{IB}>0 dB as defined in TS 38.101-2 [3], Section 7.3A.2.1 depending on the aggregated channel bandwidth, the relevant side conditions specifying received power levels (SSB_RP and Io) shall be increased by the amount $\Delta = \Delta R_{IB}$ defined for the corresponding downlink NR bands.

B.3.2.4.2 Intra-band non-contiguous carrier aggregation

For a UE configured with intra-band non-contiguous carrier aggregation in NR band in FR2, if there is a relaxation of receiver sensitivity ΔR_{IB}>0 dB as defined in TS 38.101-2 [3], Section 7.3A.2.1 depending on the aggregated channel bandwidth, the relevant side conditions specifying received power levels (SSB_RP and Io) shall be increased by the amount $\Delta = \Delta R_{IB}$ defined for the corresponding downlink NR bands.

B.3.3 Receiver sensitivity relaxation for DC

Editor's note: TBD

B.3.4 Receiver sensitivity relaxation for SUL

B.3.4.1 Receiver sensitivity relaxation for UE supporting SUL in FR1

For a UE supporting a SUL configuration in FR1, if there is a relaxation of receiver sensitivity $\Delta R_{IB,c}$>0 dB as defined in TS 38.101-1 [2], Section 7.3C.3, the relevant side conditions specifying received power levels (SSB_RP and Io) shall be increased by the amount $\Delta = \Delta R_{IB,c}$ defined for the corresponding downlink NR bands.

For a UE supporting a SUL configuration in FR1, the requirement in this section applies for both SC and SUL operation.

B.3.4.2 Receiver sensitivity relaxation for UE configured with SUL in FR1

B.3.4.2.1 Reference sensitivity exceptions due to UL harmonic interference for SUL

In this section, requirements exceptions are described for the UE with a band in FR1 when it is impacted by UL harmonic interference from another band in FR1 of the same SUL configuration.

A relevant side condition (SSB_RP and Io) in a requirement shall be increased by the amount Δ=L2-L1, where L1 is the reference sensitivity level specified in TS 38.101-1 [2], Section 7.3.2, and L2 is the reference sensitivity level based on the requirements in TS 38.101-1 [2], Section 7.3C.2, when the following conditions are fulfilled,

- a downlink component carrier is configured in NR band and is active,
- the upling is configured in the NR low operating band and is active,
- the uplink configuration is as specified in TS 38.101-1 [2], Section 7.3C.2, and
- the exception requirements specified in TS 38.101-1 [2], Section 7.3C.2 apply.

If the relaxation Δ specified in this section applies, then the relaxation specified in Section B.3.4.1 should not be applied.

Annex C (normative):
Downlink physical channels and propagation conditions

C.1 Downlink physical channels

The following clauses describe the downlink physical channels that are needed for setting a connection and channels that are needed during a connection.

C.1.1 General

TBD

C.1.2 Default downlink signal levels

The downlink power settings in Table C.1.2-1 is used unless otherwise specified in a test case. The downlink power settings in Table C.1.2-1 are also used for the initial registration for NR SA test cases in clauses 6 and 7. For EN-DC test cases in clauses 4 and 5, the E-UTRA power settings used for initial registration are defined in Annex A.6.

If the UE has more than one Rx antenna, the downlink signal is applied to each one. All UE Rx antennas shall be connected.

Table C.1.2-1: Default Downlink power levels for NR

SCS (kHz)	Parameter	Unit	Value											
	Channel bandwidth	MHz	5	10	15	20	25	30	40	50	60	80	90	100
15	Number of RBs		25	50	75	100	128	160	215	270	N/A	N/A	N/A	N/A
	Channel BW power	dBm	-60	-57	-55	-54	-53	-52	-51	-50	N/A	N/A	N/A	N/A
30	Number of RBs		10	24	36	50	64	75	100	128	162	216	243	270
	Channel BW power	dBm	-61	-57	-55	-54	-53	-52	-51	-50	-49	-48	-47	-47
60	Number of RBs		N/A	10	18	24	30	36	50	64	75	100	120	135
	Channel BW power	dBm	N/A	-58	-56	-54	-53	-52	-51	-50	-49	-48	-47	-47
	RS EPRE	dBm/15kHz	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85
Note 1: The channel bandwidth powers are informative, based on -85dBm/15kHz SS/PBCH SSS EPRE, then scaled according to the number of RBs and rounded to the nearest integer dBm value. Full RE allocation with no boost or deboost is assumed. Note 2: The power level is specified at each UE Rx antenna. Note 3: DL level is applied for any of the Subcarrier Spacing configuration ( ) with the same power spectrum density of -85dBm/15kHz.														

The default signal level uncertainty is +/-3dB at each test port, for any level specified. If the uncertainty value is critical for the Test purpose, a tighter uncertainty is specified for the related test case in Annex F

C.1.3 Default connection setup

Table C.1.3-1 describes the downlink physical channels that are required for NR connection setup. For EN-DC test cases in clauses 4 and 5, the required E-UTRA downlink physical channels are defined in TS 36.521-3 [26] Annex C.2.

Table C.1.3-1: Downlink physical channels required for NR connection set-up

Physical Channel	EPRE Ratio	Note
PBCH	PBCH_RA = 0 dB	
	PBCH_RB = 0 dB	
PSS	PSS_RA = 0 dB	
SSS	SSS_RA = 0 dB	
PDCCH	PDCCH_RA = 0 dB	
	PDCCH_RB = 0 dB	
	MPDCCH_RB = 0 dB	
PDSCH	PDSCH_RA = 0 dB	
	PDSCH_RB = 0 dB	
DMRS	TBD	
CSI-RS	TBD	
Note 1: No boosting is applied		

C.2 Propagation conditions

The propagation conditions and channel models for various environments are specified. For each environment a propagation model is used to evaluate the propagation pathless due to the distance. Channel models are formed by combining delay profiles with a Doppler spectrum, with the addition of correlation properties in the case of a multi-antenna scenario.

C.2.1 No interference

The downlink connection between the SS and the UE is without AWGN, and has no fading or multipath effects.

C.2.2 Static propagation conditions

The downlink connection between the SS and the UE is an AWGN environment (unless otherwise stated) with no fading or multipath effects.

C.2.2.1 UE receiver with 2Rx antenna connectors

For 1 port transmission to UE receiver with 2Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}.$$

For 2 port transmission to UE Receiver with 2Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{pmatrix} 1 & j \\ 1 & -j \end{pmatrix}$$

For 4 port transmission to UE Receiver with 2Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & j & j \\ 1 & 1 & -j & -j \end{bmatrix}$$

C.2.2.2 UE receiver with 4Rx antenna connectors

For 1 port transmission to UE receiver with 4Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}.$$

For 2 port transmission to UE Receiver with 4Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & j \\ 1 & -j \\ 1 & j \\ 1 & -j \end{bmatrix}.$$

For 4 port transmission to UE Receiver with 4Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & j & j \\ 1 & 1 & -j & -j \\ 1 & -1 & j & -j \\ 1 & -1 & -j & j \end{bmatrix}.$$

C.2.3 Multi-path fading propagation conditions

TBD

Annex D (normative): Deviations from standard test configuration

This annex summarizes the list of test cases which deviate from the standard test configuration.

D.1 Test cases with different numerologies

TBD

D.2 EN-DC test cases with different EN-DC configurations

In clauses 4 and 5, EN-DC test cases may be defined for two component carriers (CCs) as well as for more than two CCs to verify the same RRM requirement.

D.2.1 Principle of testing

If multiple EN-DC test cases are defined for two CCs as well as for more than two CCs to verify the same type of RRM requirement, and this requirement is dependent on the number of CCs, then from the UE performance point of view the test coverage can be considered fulfilled by executing only the EN-DC test cases with the maximum number of CCs in EN-DC supported by the UE. Otherwise if the same type of RRM requirement is independent of the number of CCs then from the UE performance point of view the test coverage can be considered fulfilled by executing only the EN-DC test cases with two CCs in EN-DC supported by the UE.

Editor's Note: The maximum number of CCs that can be used in FR2 tests in EN-DC would depend on the test equipment capability.

D.3 Carrier aggregation test cases with different CA configurations

In clauses 6 and 7, carrier aggregation test cases may be defined for two CCs as well as for more than two CCs to verify the same RRM requirement.

D.3.1 Principle of testing

If multiple carrier aggregation test cases are defined for two CCs as well as for more than two CCs to verify the same RRM requirement, and the test requirement is dependent on the number of CCs, then from the UE performance point of view the test coverage can be considered fulfilled by executing only the CA test cases with the maximum number of CCs in CA supported by the UE. Otherwise if the same type of RRM requirement is independent of the number of CCs then from the UE performance point of view the test coverage can be considered fulfilled by executing only the CA test cases with at least two CCs in CA supported by the UE.

Editor's: The maximum number of CCs that can be used in FR2 tests in CA would depend on the test equipment capability.

D.4 Antenna connection for 4Rx capable UEs

All the tests in this test specification are defined for UEs supporting 2Rx. This section explains how to apply the 2Rx tests in clauses 4 and 6 to UEs supporting 4Rx antenna ports. No tests are currently specified in clauses 4 or A.6 which are applicable only to 4Rx antenna ports, so 4Rx capable UEs are always tested by reusing tests which were originally specified for 2Rx UEs. Please notice that 4Rx is in general not supported for the test cases in clauses 5 and 7.

D.4.1 Principle of testing

D.4.1.1 Single carrier tests

For 4Rx capable UEs supporting at least one 2Rx band, all single carrier tests specified in clauses 4 and 6, except 4.7 and 6.7 shall be tested with 2Rx on any band where 2Rx is supported, with the antenna connection defined in D.4.2.1. Single carrier tests specified clauses 4.7 and 6.7 are band dependent and shall be tested in all bands supported by the UE, using 2Rx and the antenna connection defined in D.4.2.1 for the bands where 2Rx is supported, and 4Rx and the antenna connection defined in D.4.2.2 for the bands where 2Rx is not supported.

For 4Rx capable UEs that do not support any 2Rx band, all single carrier tests in clauses 4 and 6 shall be tested with 4Rx using the antenna configuration defined in D.4.2.2.

D.4.1.2 Carrier aggregation tests

For carrier aggregation tests, the antenna connection is selected independently for each cell, the PCell and the SCell(s). If a cell (either PCell or any of the SCell(s)) is on a band where 2Rx is supported, antenna connection in Section D.4.2.1 shall be used for this cell. If the cell is on a band where 2Rx is not supported, antenna connection in section D.4.2.2 shall be used for this cell.

D.4.1.3 EN-DC tests

For all EN-DC tests, the antenna connection is selected independently for each cell. For the E-UTRA PCell, the antenna connection specified in D.4.2.3 shall be used if the PCell is on an E-UTRA band supporting 2Rx, and the antenna connection specified in D.4.2.4 shall be used if the PCell is on an E-UTRA band not supporting 2Rx.

For the NR PSCell and SCell(s), the principle of testing is the same as in D.4.1.2.

D.4.2 Antenna connection

D.4.2.1 Antenna connection for NR bands where 2Rx is supported

For NR bands where 2Rx is supported, the UE shall decide via manufacturer declaration and AP configuration which 2 of the 4 antenna ports shall be connected with the downlink signal from the SS. The remaining 2 antenna ports shall be connected to zero input. The parameters and test requirements remain unmodified.

D.4.2.2 Antenna connection for NR bands where only 4Rx is supported

For NR bands where only 4Rx is supported, all 4Rx antenna ports shall be connected to the downlink signal from the SS. The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring tests specified in section TBD, the parameters and test requirements remain unmodified.

D.4.2.3 Antenna connection for E-UTRA bands where 2Rx is supported

For E-UTRA bands where 2Rx is supported, the UE shall decide via manufacturer declaration and AP configuration which 2 of the 4 antenna ports shall be connected with the downlink signal from the SS. The remaining 2 antenna ports shall be connected to zero input. The parameters and test requirements remain unmodified.

D.4.2.4 Antenna connection for NR bands where only 4Rx is supported

For E-UTRA bands where only 4Rx is supported, all 4Rx antenna ports shall be connected to the downlink signal from the SS. The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring tests specified in section TBD, the parameters and test requirements remain unmodified.

Annex E (normative): Cell configuration mapping

The cells used in TS 38.533 do not correspond to the cells defined in TS 38.508-1 [14] section 4.4.2. This annex describes the mapping between the test cases in TS 38.533 and the cells defined in TS 38.508-1 [14]. The test case shall apply the RF parameters as defined in TS 38.533 according to the column heading.

NOTE: For example if the second cell in a test case is an inter-frequency cell then Cell3 from TS 38.508-1 [14] section 4.4.2 is used with the radio parameters as defined for Cell2 in TS 38.533.

E.1 Test frequency selection

The requirements defined in this test specification comprise EN-DC and NR SA test cases. The test cases are defined with a single NR cell or with multiple NR cells. The multi-cell test cases can be either intra-frequency, i.e. the NR cells defined by the test are overlapping in the frequency domain, or inter-frequency, i.e. the NR cells defined by the test have different center frequencies, separated from each other by a frequency value bigger than the respective cell bandwidths. This clause describes the general rule on how to select the test frequencies for the NR RRM test cases in this test specification.

E.1.1 E-UTRA PCell for EN-DC test cases

Unless otherwise stated, the E-UTRA PCell for EN-DC test cases shall be configured using the test frequency “Mid” as defined in TS 36.508 [25] for the corresponding E-UTRA band.

In case that the “Mid” test frequency overlaps with any of the NR test frequencies required by the test case, the E-UTRA PCell shall be shifted to an additional frequency within the E-UTRA same band. If the E-UTRA band channel bandwidth is not sufficient to allocate a non-overlapping E-UTRA PCell, the auxiliary band as defined in TS 36.521-3 [26] clause 3 shall be used.

E.1.2 Test cases with one NR cell

Unless otherwise stated, for NR test cases with one NR cell, this cell shall be configured using the test frequency “Mid” as defined in TS 38.508-1 [14] for the corresponding band under test.

E.1.3 Test cases with more than one NR cell

E.1.3.1 Intra-frequency test cases

Unless otherwise stated, multi-cell intra-frequency test cases shall be tested using the test frequency “Mid” as defined in TS 38.508-1 [14] for the corresponding NR band under test.

E.1.3.2 Inter-frequency test cases

For NR SA multi-cell inter-frequency test cases, unless otherwise stated, the serving cell (and any other neighbour cell in the same frequency carrier) shall be configured using the test frequency “Mid” as defined in TS 38.508-1 [14] for the corresponding band under test. Any inter-frequency neighbour cell shall be configured using a non-overlapping test frequency adjacent to the serving cell frequency, as defined in TBD.

For EN-DC multi-cell inter-frequency test cases, unless otherwise stated, the PSCell (and any other neighbour cell in the same frequency carrier) shall be configured using the test frequency “Mid” as defined in TS 38.508-1 [14] for the corresponding band under test. Any inter-frequency neighbour cell shall be configured using a non-overlapping test frequency adjacent to the PSCell frequency, as defined in TBD.

E.1.4 Carrier aggregation test cases

E.1.4.1 Inter-band carrier aggregation

For inter-band carrier aggregation test cases, each of the component carriers and their respective neighbour cells shall be configured following the sample principles defined in E.1.2 and E.1.3.

E.1.4.2 Intra-band contiguous carrier aggregation

For intra-band contiguous carrier aggregation, the test frequency selection shall be done following the same principle as in E.1.3.2 for inter-frequency test cases.

E.1.4.3 Intra-band non-contiguous carrier aggregation

For intra-band non-contiguous carrier aggregation in FR1, unless otherwise specified, the test frequency selection shall be done following the maximum Wgap principle, i.e. selecting the test frequencies (of the test frequencies defined in TS 38.508-1 [14]) with the widest frequency separation within the band under test.

For intra-band non-contiguous carrier aggregation in FR2, the test frequency selection is TBD.

E.2 Cell configuration mapping for EN-DC FR1 test cases in Chapter 4

Table E.2-1 defines the cell configuration mapping for EN-DC FR1 test cases in chapter 4 of this test specification.

Table E.2-1: Cell configuration mapping for RRM testing

TC	Description	38.533 LTE Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
4.4.3.1	EN-DC FR1 timing advance adjustment accuracy	LTE Cell 1	NR Cell 1			
4.4.1.1	EN-DC FR1 UE transmit timing accuracy	LTE Cell1	NR Cell1			
4.6.1.1	EN-DC FR1 event-triggered reporting without gap in non-DRX	TBD	TBD	TBD		
4.6.1.2	EN-DC FR1 event-triggered reporting without gap in DRX	TBD	TBD	TBD		
4.6.1.3	EN-DC FR1 event-triggered reporting with gap in non-DRX	TBD	TBD	TBD		
4.6.1.4	EN-DC FR1 event-triggered reporting with gap in DRX	TBD	TBD	TBD		
4.6.1.5	EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection	TBD	TBD	TBD		
4.6.1.6	EN-DC FR1 event-triggered reporting with gap in non-DRX with SSB time index detection	TBD	TBD	TBD		
4.6.2.1	EN-DC FR1-FR1 event-triggered reporting in non-DRX	Cell 1	NR Cell 6	NR Cell 3		
4.6.2.2	EN-DC FR1-FR1 event-triggered reporting in DRX	Cell 1	NR Cell 6	NR Cell 3		
4.6.2.3	EN-DC FR1-FR2 event-triggered reporting in non-DRX	TBD	TBD	TBD		
4.6.2.4	EN-DC FR1-FR2 event-triggered reporting in DRX	TBD	TBD	TBD		
4.6.2.5	EN-DC FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection	Cell 1	NR Cell 6	NR Cell 3		
4.6.2.6	EN-DC FR1-FR1 event-triggered reporting in DRX with SSB time index detection	Cell 1	NR Cell 6	NR Cell 3		

TC	Description	38.533 LTE Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
4.6.2.7	EN-DC FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection	TBD	TBD	TBD		
4.6.2.8	EN-DC FR1-FR2 event-triggered reporting in DRX with SSB time index detection	TBD	TBD	TBD		
4.7.1.1.1	EN-DC FR1 SS-RSRP absolute measurement accuracy	TBD	TBD	TBD		
4.7.1.1.2	EN-DC FR1 SS-RSRP relative measurement accuracy	TBD	TBD	TBD		
4.7.1.2.1	EN-DC FR1-FR1 SS-RSRP absolute measurement accuracy	TBD	TBD	TBD		
4.7.1.2.2	EN-DC FR1-FR1 SS-RSRP relative measurement accuracy	TBD	TBD	TBD		

E.3 Cell configuration mapping for EN-DC FR2 test cases in Chapter 5

Table E.3-1 defines the cell configuration mapping for EN-DC FR2 test cases in chapter 5 of this test specification.

Table E.3-1: Cell configuration mapping for EN-DC FR2 RRM testing

TC	Description	38.533 LTE Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
5.6.2.1	EN-DC FR2-FR2 event-triggered reporting in non-DRX	TBD	TBD	TBD		
5.6.2.2	EN-DC FR2-FR2 event-triggered reporting in DRX	TBD	TBD	TBD		
5.6.2.3	EN-DC FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection	TBD	TBD	TBD		
5.6.2.4	EN-DC FR2-FR2 event-triggered reporting in DRX with SSB time index detection	TBD	TBD	TBD		
5.7.1.1	EN-DC FR2 SS-RSRP measurement accuracy	TBD	TBD	TBD		
5.7.1.2	EN-DC FR2-FR2 SS-RSRP measurement accuracy	TBD	TBD	TBD		

E.4 Cell configuration mapping for SA FR1 test cases in Chapter 6

Table E.4-1 defines the cell configuration mapping for SA FR1 test cases in chapter 6 of this test specification.

Table E.4-1: Cell configuration mapping for SA FR1 RRM testing

TC	Description	38.533 NR Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
6.5.5.3	NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX	NR Cell 1				
6.5.5.4	NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX	NR Cell 1				
6.6.1.1	SA event triggered reporting tests without gap under non-DRX	NR Cell 1	NR Cell 2			
6.6.1.2	SA event triggered reporting tests without gap under DRX	NR Cell 1	NR Cell 2			
6.6.1.3	SA event triggered reporting tests with per-UE gaps under non-DRX	NR Cell 1	NR Cell 2			

TC	Description	38.533 NR Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
6.6.1.4	SA event triggered reporting tests with per-UE gaps under DRX	NR Cell 1	NR Cell 2			
6.6.1.5	SA event triggered reporting tests without gap under non-DRX with SSB index reading	NR Cell 1	NR Cell 2			
6.6.1.6	SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading	NR Cell 1	NR Cell 2			
6.6.2.1	NR SA FR1-FR1 event-triggered reporting in non-DRX	NR Cell 6	NR Cell 3			
6.6.2.2	NR SA FR1-FR1 event-triggered reporting in DRX	NR Cell 6	NR Cell 3			
6.6.2.3	NR SA FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection	NR Cell 6	NR Cell 3			
6.6.2.4	NR SA FR1-FR1 event-triggered reporting in DRX with SSB time index detection	NR Cell 6	NR Cell 3			
6.7.1.3.1	NR SA FR1-FR2 SS-RSRP absolute measurement accuracy	NR Cell 1	NR Cell 2			
6.7.1.3.2	NR SA FR1-FR2 SS-RSRP relative measurement accuracy	NR Cell 1	NR Cell 2			
6.7.1.1.1	NR SA FR1 SS-RSRP absolute measurement accuracy	TBD	TBD			
6.7.1.1.2	NR SA FR1 SS-RSRP relative measurement accuracy	TBD	TBD			
6.7.1.2.1	NR SA FR1-FR1 SS-RSRP absolute measurement accuracy	TBD	TBD			
6.7.1.2.2	NR SA FR1-FR1 SS-RSRP relative measurement accuracy	TBD	TBD			

E.5 Cell configuration mapping for SA FR2 test cases in Chapter 7

Table E.5-1 defines the cell configuration mapping for SA FR2 test cases in chapter 7 of this test specification.

Table E.5-1: Cell configuration mapping for SA FR2 RRM testing

TC	Description	38.533 NR Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
7.5.5.1	NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX	NR Cell 1				
7.5.5.2	NR SA FR2 SSB-based beam failure detection and link recovery in DRX	NR Cell 1				
7.5.5.3	NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX	NR Cell 1				
7.5.5.4	NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX	NR Cell 1				
7.6.2.1	NR SA FR2-FR2 event-triggered reporting in non-DRX	TBD	TBD			
7.6.2.2	NR SA FR2-FR2 event-triggered reporting in DRX	TBD	TBD			
7.6.2.3	NR SA FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection	TBD	TBD			
7.6.2.4	NR SA FR2-FR2 event-triggered reporting in DRX with SSB time index detection	TBD	TBD			
7.6.2.5	NR SA FR1-FR2 event-triggered reporting in non-DRX	TBD	TBD			
7.6.2.6	NR SA FR1-FR2 event-triggered reporting in DRX	TBD	TBD			
7.6.2.7	NR SA FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection	TBD	TBD			

TC	Description	38.533 NR Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
7.6.2.8	NR SA FR1-FR2 event-triggered reporting in DRX with SSB time index detection	TBD	TBD			
7.7.1.1	NR SA FR2 SS-RSRP measurement accuracy	TBD	TBD	TBD		
7.7.1.2	NR SA FR2-FR1 SS-RSRP measurement accuracy	TBD	TBD	TBD		

Annex F (normative): Measurement uncertainties and test tolerances

The requirements of this clause apply to all tests in the present document.

F.1 Measurement uncertainties and test tolerances for FR1

F.1.1 Acceptable uncertainty of test system (normative)

See TS 38.521-1 [17] annex F.1.

F.1.1.1 Measurement of test environments

See TS 38.521-1 [17] Annex F1.1.

F.1.1.2 Measurement of RRM requirements

This clause defines the maximum test system uncertainty for the RRM requirements. The maximum uncertainty values allowed for the typical RRM measurement uncertainty contributors is defined in Table F.1.1.2-1. Unless explicitly stated for a particular test case, these maximum uncertainty values should be used as starting point to perform the test tolerance analysis in TR 38.903 [22] for each of the test cases. Specific test cases might require a tigher measurement uncertainty value for some of the contributors. Exceptions to the general values in Table F.1.1.2-1 shall be handled case by case.

Table F.1.1.2-1: Maximum allowed measurement uncertainty values for the test system for FR1 (up to 6 GHz) and Cell BW BW ≤ 40 MHz

MU contributor	Unit	Value	Comment
AWGN absolute power, N_{oc}	dB	±1.5	
Ratio of cell X signal / AWGN, $\hat{E}s_x$ / N_{oc}	dB	±0.3	Same as in LTE
Fading profile uncertainty*	dB	±TBD	Depends on fading profile, can be referenced from TS 38.101-4 [20]
AWGN and signal flatness*	dB	±2.0	Same as in LTE, can be referenced from TS 38.101-4 [20]
Uplink absolute power measurement	dB	±1.5	Same as in TS 38.101-1 [17]
Uplink relative power measurement	dB	±0.7	Same as in TS 38.101-1 [17]
Uplink signal transmit timing relative to downlink	Tc	±112	
Relative transmit timing accuracy during UE timing adjustment	Tc	±88	
Timing Advance Adjustment accuracy	Tc	±88	
Note 1: The values in this table are specified per cell. Multi-cell test cases need to combined these values in the TT analysis in TR 38.903 Note 2: These values apply for cell BW ≤ 40 MHz. The maximum allowed measurement uncertainty for higher cell BW is FFS.			

The maximum test system uncertainty for the EN-DC FR1 test cases in chapter 4 is defined in Table F.1.1.2-2.

The maximum test system uncertainty for the NR SA FR1 test cases in chapter 6 is defined in Table F.1.1.2-3.

Table F.1.1.2-2: Maximum test system uncertainty for RRM requirements for EN-DC FR1 test cases

Subclause	Maximum Test System Uncertainty[1]	Derivation of Test System Uncertainty
4.3.2.2.1	Noc ±1.5 dB Ês / Noc ±0.3 dB Uplink absolute power measurement ±1.5 dB Uplink relative power measurement ±0.7 dB ±112T_c Uplink signal transmit timing relative to downlink	$Ês_1$ / N_{oc} is the ratio of cell 1 signal / AWGN T_c = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7]
4.3.2.2.2	Same as 4.3.2.2.1	Same as 4.3.2.2.1
4.4.3.1 EN-DC FR1 timing advance adjustment accuracy	Noc ±1.5 dB $Ês_1$ / N_{oc} ±0.3 dB ±88T_c Timing Advance Adjustment accuracy	$Ês_1$ / N_{oc} is the ratio of cell 1 signal / AWGN T_c = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7]

Table F.1.1.2-3 Maximum test system uncertainty for RRM requirements for SA FR1 test cases

Subclause	Maximum Test System Uncertainty[1]	Derivation of Test System Uncertainty
6.3.2.2.1	N_{oc} ±1.5 dB Ês / N_{oc} ±0.3 dB Uplink absolute power measurement ±1.5 dB Uplink relative power measurement ±0.7 dB ±112Tc Uplink signal transmit timing relative to downlink	$Ês_1$ / N_{oc} is the ratio of cell 1 signal / AWGN T_c = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7]
6.3.2.2.2	Same as 6.3.2.2.1	Same as 6.3.2.2.1
6.6.1.1 SA event triggered reporting tests without gap under non-DRX	Noc ±1.5 dB Ês1 / Noc ±0.3 dB Ês2 / Noc ±0.3 dB	Note: Ês1 / Noc is the ratio of cell 1 signal / AWGN Ês2 / Noc is the ratio of cell 2 signal / AWGN
6.6.1.2 SA event triggered reporting tests without gap under DRX	Same as 6.6.1.1	Same as 6.6.1.1
6.6.1.3 SA event triggered reporting tests with per-UE gaps under non-DRX	Same as 6.6.1.1	Same as 6.6.1.1
6.6.1.4 SA event triggered reporting tests with per-UE gaps under DRX	Same as 6.6.1.1	Same as 6.6.1.1
6.6.1.5 SA event triggered reporting tests without gap under non-DRX with SSB index reading	Same as 6.6.1.1	Same as 6.6.1.1
6.6.1.6 SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading	Same as 6.6.1.1	Same as 6.6.1.1

F.1.2 Interpretation of measurement results (normative)

See TS 38.521-1 [17] Annex F.2.

F.1.3 Test Tolerance and Derivation of Test Requirements (informative)

See TS 38.521-1 [17] Annex F.3.

F.1.3.1 Measurement of test environments

See TS 38.521-1 [17] Annex F.3.1.

F.1.3.2 Measurement of RRM requirements

Because the relationships between the test system uncertainties and the test tolerances are often complex, it is not always possible to give a simple derivation of the test requirement in this document. The analysis is recorded in 3GPP TR 38 903 [22].

The derivation of the test requirements for the EN-DC FR1 test cases in chapter 4 is defined in Table F.1.3.2-1.

The derivation of the test requirements for the NR SA FR1 test cases in chapter 6 is defined in Table F.1.3.2-2.

Table F.1.3.2-1: Derivation of test requirements for EN-DC FR1 RRM tests

Test	Minimum requirement in TS 38.133 [6]	Test tolerance (TT)	Test requirement in TS 38.533
4.3.2.2.1	Absolute uplink power: Normal conditions ±9dB Relative uplink power step: Normal conditions ±2.5dB Uplink timing: 15kHz SCS T_e ±12*64*T_c 30kHz SCS T_e ±8*64*T_c	 2.1dB 0.7dB 112T_c 112T_c	Absolute uplink power: Normal conditions ±11.1dB Relative uplink power step: Normal conditions ±3.2dB Uplink timing: 15kHz SCS T_e ±880*T_c 30kHz SCS Te ±624*T_c
4.3.2.2.2	Same as 4.3.2.2.1	Same as 4.3.2.2.1	Same as 4.3.2.2.1
4.4.1.1 EN-DC FR1 UE transmit timing accuracy	Test 1 (no DRX): Uplink timing: ±12*64 T_c for 15 KHz SSB SCS,15 kHz UL SCS ±10*64 T_c for 15 KHz SSB SCS,30 kHz UL SCS ±10*64 T_c for 15 KHz SSB SCS,60 kHz UL SCS ±8*64 T_c for 30 KHz SSB SCS,15 kHz UL SCS ±8*64 T_c for 30 KHz SSB SCS,30 kHz UL SCS ±7*64 T_c for 30 KHz SSB SCS,60 kHz UL SCS Max step size T_q: 5.5*64*T_c Min adjust rate T_p: 5.5*64*T_c Max adjust rate: 5.5*64*T_c Ês / N_{oc}: +3.00dB N_{oc} = -98 dBm/15 kHz (Config 1,2,3) Test 2 (with DRX): ±12*64 T_c for 15 KHz SSB SCS,15 kHz UL SCS ±10*64 T_c for 15 KHz SSB SCS,30 kHz UL SCS ±10*64 T_c for 15 KHz SSB SCS,60 kHz UL SCS ±8*64 T_c for 30 KHz SSB SCS,15 kHz UL SCS ±8*64 T_c for 30 KHz SSB SCS,30 kHz UL SCS ±7*64 T_c for 30 KHz SSB SCS,60 kHz UL SCS Ês / N_{oc}: +3.00dB	 ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c +0.5*64T_c -3.6*64*T_c +1.1*64*T_c +0.3 dB +1.5 dB ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c +0.3dB	 Test 1 (10MHz Ch BW): Uplink timing: ±13.75*64*T_c Uplink timing: ±11.75*64*T_c Uplink timing: ±11.75*64*T_c Uplink timing: ±9.75*64*T_c Uplink timing: ±9.75*64*T_c Uplink timing: ±8.75*64*T_c Max step size T_q: 6.0*64*T_c Min adjust rate: 1.9*64*T_c Max adjust rate: 6.6*64*T_c Ês / N_{oc}: +3.30dB N_{oc} = -98 dBm/15 kHz (Config 1,2,3) +1.5 dB Test 2 (with DRX): Uplink timing: ±13.75*64*T_c Uplink timing: ±11.75*64*T_c Uplink timing: ±11.75*64*T_c Uplink timing: ±9.75*64*T_c Uplink timing: ±9.75*64*T_c Uplink timing: ±8.75*64*T_c Ês / N_{oc}: +3.30dB
4.4.3.1 EN-DC FR1 timing advance adjustment accuracy	N_{oc} = -98 dBm/15 kHz (Config 1, 2, 4, 5) N_{oc} = -95 dBm/15 kHz (Config 3, 6) Ês$_x$ / N_{oc} = 3 dB UE Timing Advance Adjustment Accuracy for 15kHz SCS = ±256 T_c+ TT UE Timing Advance Adjustment Accuracy for 30kHz SCS = ±256 T_c+ TT	0 0 0 +/- 88 Tc +/- 88 Tc	N_{oc} = -98 dBm/15 kHz (Config 1, 2, 4, 5) N_{oc} = -95 dBm/15 kHz (Config 3, 6) Ês$_x$ / N_{oc} = 3 dB UE TAAA for 15kHz SCS = ±344 T_c UE TAAA for 30kHz SCS = ±344 T_c

Table F.1.3.2-2: Derivation of test requirements for NR SA FR1 RRM tests

Test	Minimum requirement in TS 38.133 [6]	Test tolerance (TT)	Test requirement in TS 38.533
6.3.2.2.1	Absolute uplink power: Normal conditions ±9dB Relative uplink power step: Normal conditions ±2.5dB Uplink timing: 15kHz SCS T_e ±12*64*T_c 30kHz SCS T_e ±8*64*T_c	 2.1dB 0.7dB $112T_c$ $112T_c$	Absolute uplink power: Normal conditions ±11.1dB Relative uplink power step: Normal conditions ±3.2dB Uplink timing: 15kHz SCS T_e ±880*T_c 30kHz SCS T_e ±624*T_c
6.3.2.2.2	Same as 6.3.2.2.1	Same as 6.3.2.2.1	Same as 6.3.2.2.1
6.6.1.1 SA event triggered reporting tests without gap under non-DRX	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +4.00dB Ês2 / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês1 / Noc: +4.00dB Ês2 / Noc: +4.00dB	During T1: 0dB 0dB 0dB During T2: 0dB 0dB 0dB	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +4.00dB Ês2 / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês1 / Noc: +4.00dB Ês2 / Noc: +4.00dB
6.6.1.2 SA event triggered reporting tests without gap under DRX	Same as 6.6.1.1	Same as 6.6.1.1	Same as 6.6.1.1
6.6.1.3 SA event triggered reporting tests with per-UE gaps under non-DRX	Same as 6.6.1.1	Same as 6.6.1.1	Same as 6.6.1.1
6.6.1.4 SA event triggered reporting tests with per-UE gaps under DRX	Same as 6.6.1.1	Same as 6.6.1.1	Same as 6.6.1.1
6.6.1.5 SA event triggered reporting tests without gap under non-DRX with SSB index reading	Same as 6.6.1.1	Same as 6.6.1.1	Same as 6.6.1.1
6.6.1.6 SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading	Same as 6.6.1.1	Same as 6.6.1.1	Same as 6.6.1.1

Annex G (normative): Statistical testing

G.1 General

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

G.2 Statistical testing of delay and UE measurement performance in RRM tests

G.2.1 General

The RRM tests are either of deterministic or of statistical nature. The pass fail limits in tests of statistical nature are expressed as a limit (e.g. delay limit) and a success ratio applicable for the limit. The success ratio is 90% uniform (the complement is the error ratio ER = 10%).

G.2.2 Design of the test

The test is defined by the following design principles (see TS 36.521-1 clause G.X, Theory):

1) The early decision concept is applied.

2) A second limit is introduced: bad DUT factor M>1

To decide the test pass:

Supplier risk is applied based on the bad DUT quality

To decide the test fails

Customer risk is applied based on the specified DUT quality

The test is defined by the following parameters:

1) Limit ER = 0.1 (success ratio = 90%)

2) Bad DUT factor M=1.5 (selectivity)

3) Confidence level CL = 95% (for specified DUT and bad DUT-quality)

G.2.3 Numerical definition of the pass fail limits

Editor's Note:

- Further investigate the technical details behind this statistical method to ensure that this is applicable for FR2 radiated test cases.

Table G.2.3-1: pass fail limits

ne	ns_p	ns_f	ne	ns_p	ns_f	ne	ns_p	ns_f	ne	ns_p	ns_f
0	33	NA	43	408	283	86	737	644	129	1056	1021
1	46	NA	44	416	291	87	745	653	130	1064	1030
2	58	NA	45	424	299	88	752	661	131	1071	1039
3	69	NA	46	432	307	89	760	670	132	1078	1048
4	79	NA	47	440	315	90	767	679	133	1086	1057
5	89	NA	48	447	324	91	775	687	134	1093	1066
6	99	NA	49	455	332	92	782	696	135	1100	1074
7	109	NA	50	463	340	93	790	705	136	1108	1083
8	118	NA	51	471	348	94	797	713	137	1115	1092
9	127	NA	52	478	356	95	804	722	138	1122	1101
10	136	39	53	486	365	96	812	731	139	1130	1110
11	145	45	54	494	373	97	819	739	140	1137	1119
12	154	51	55	502	381	98	827	748	141	1144	1128
13	163	58	56	509	389	99	834	757	142	1152	1137
14	172	64	57	517	398	100	842	766	143	1159	1147
15	180	71	58	525	406	101	849	774	144	1166	1155
16	189	78	59	532	414	102	857	783	145	1174	1164
17	197	85	60	540	423	103	864	792	146	1181	1173
18	206	92	61	548	431	104	871	801	147	NA	1182
19	214	99	62	555	440	105	879	809	148		
20	223	106	63	563	448	106	886	818	149		
21	231	113	64	571	456	107	894	827	150		
22	239	120	65	578	465	108	901	836	151		
23	248	128	66	586	473	109	909	844	152		
24	256	135	67	594	482	110	916	853	153		
25	264	142	68	601	490	111	923	862	154		
26	272	150	69	609	499	112	931	871	155		
27	281	157	70	616	507	113	938	880	156		
28	289	165	71	624	516	114	946	888	157		
29	297	173	72	632	524	115	953	897	158		
30	305	180	73	639	533	116	960	906	159		
31	313	188	74	647	541	117	968	915	160		
32	321	196	75	654	550	118	975	924	161		
33	329	204	76	662	558	119	983	933	162		
34	337	211	77	669	567	120	990	941	163		
35	345	219	78	677	575	121	997	950	164		
36	353	227	79	684	584	122	1005	959	165		
37	361	235	80	692	592	123	1012	968	166		
38	369	243	81	700	601	124	1019	977	167		
39	377	251	82	707	610	125	1027	986	168		
40	385	259	83	715	618	126	1034	994	169		
41	393	267	84	722	627	127	1042	1003			
42	400	275	85	730	635	128	1049	1012			

The first column is the number of errors (ne = number of exceeded delays or number of wrong reports)

The second column is the number of samples for the pass limit (ns_p , ns=Number of samples= number of successes + number of exceedings or number of reports)

The third column is the number of samples for the fail limit (ns_f)

G.2.4 Pass fail decision rules

The pass fail decision rules apply for a single test, comprising one component in the test vector. The over all Pass /Fail conditions are defined in clause G.2.6

Having observed 0 errors, pass the test at 33+ samples, otherwise continue

Having observed 1 error, pass the test at 46+ samples, otherwise continue

Having observed 2 errors, pass the test at 58+ samples, otherwise continue

Having observed 10 errors, pass the test at 136+ samples, fail the test at 39 samples, otherwise continue

Having observed 146 errors, pass the test at 1181+ samples, fail the test at 1173- samples, otherwise continue

Having observed 147 errors, fail the test at 1182- samples,

Where x+ means: x or more, x- means x or less

NOTE 1: an ideal DUT passes after 33 samples. The maximum test time is 1181 samples.

G.2.5 Void

G.2.6 Test conditions for delay tests and UE measurement performance

Table G.2.6-1: test conditions

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test	Over all Pass/Fail condition
All tests in clauses 4.4.3, 4.5, 4.6, 5.4.3, 5.5, 5.6, 6.1, 6.2, 6.3.1, 6.3.2.1, 6.3.2.3, 6.4.3, 6.5, 6.6, 7.1, 7.2, 7.3.1, 7.3.2.1, 7.3.2.3, 7.4.3, 7.5, 7.6 are delay tests of statistical nature while 4.3.2.2, 4.4.1, 5.3.2.2, 5.4.1, 6.3.2.2, 6.4.1, 7.3.2.2, 7.4.1 are not applicable, since they are deterministic.	Test procedure in all statistical tests ensures independency	1 per operating band (if tested, see 3A.3.3)	Full set of environmental conditions (5) per operating band
All tests in clauses 4.7, 5.7, 6.7 and 7.7 are UE level reports of statistical nature	Independency is assumed, although Layer 1 filtering is applied to the reported results	Full set of environmental conditions (5) per operating band	Full set of environmental conditions (5) per operating band

G.X Theory to derive the numbers in Table G.2.3-1 (informative)

TS 36.521-1 Annex G.X applies.

Annex H (normative): Default message contents for RRM

H.3.1 RRC messages and information elements contents exceptions for NR measurement configuration

RRCReconfiguration: to setup NR Measurement Configuration

Table H.3.1-1: *RRCReconfiguration*: NR measurement Configuration

Derivation Path: TS 38.508-1, Table 4.6.1-3 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration ::= SEQUENCE {			
measConfig	MeasConfig-DEFAULT	Measurements configuration	
}			
}			
}			

MeasConfig-DEFAULT: Configuration for NR measurement

Table H.3.1-2: MeasConfig-DEFAULT: Configuration of NR measurement

Derivation path: 38.508-1 table 4.6.3-50			
Information Element	**Value/Remark**	**Comment**	**Condition**
measConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE {	1 entry		
measObjectId[1]	MeasObjectId		
measObject[1] CHOICE {			
measObjectNR	MeasObjectNR-DEFAULT		
}			
}			
reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	ReportConfigId		
reportConfig[1] CHOICE {			
reportConfigNR	ReportConfigNR-DEFAULT		
}			
}			
measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE {	1 entry		
measId[1]	MeasId		
measObjectId[1]	MeasObjectId		
reportConfigId[1]	ReportConfigId		
}			
quantityConfig	QuantityConfig-DEFAULT		
measGapConfig	MeasGapConfig-DEFAULT		GAP NEEDED
}			

Condition	Explanation

GAP NEEDED	Measurement gap is needed for measurement.

MeasObjectNR-DEFAULT: NR measurement object configuration

Table H.3.1-3: MeasObjectNR-DEFAULT: NR intra-frequency measurement object configuration for FR1

Derivation Path: TS 38.508-1, Table 4.6.3-56			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
ssbFrequency	ARFCN-ValueNR with condition DL_SSB	frequency of the serving cell	
ssbSubcarrierSpacing	kHz15		SSB.1 FR1
	kHz30		SSB.2 FR1
smtc1 SEQUENCE{			
periodicityAndOffset CHOICE {			
sf20	0		
}			
duration	sf1		SMTC pattern 1
	sf5		SMTC pattern 2
}			
referenceSignalConfig SEQUENCE {			
ssb-ConfigMobility SEQUENCE {			
ssb-ToMeasure	Not present		
deriveSSB-IndexFromCell	false		Asynchronous cells
	true		Synchronous cells
}			
}			
absThreshSS-BlocksConsolidation SEQUENCE {			
thresholdRSRP	0	SS-RSRP < -156dB	
}			

Condition	Explanation
SSB.1 FR1	SSB pattern 1 in FR1 according to TS 38.133 [6] A.3.10.1.1
SSB.2 FR1	SSB pattern 2 in FR1 according to TS 38.133 [6] A.3.10.1.2
SMTC pattern 1	SMTC pattern 1 according to TS 38.133 [6] A.3.11.1
SMTC pattern 2	SMTC pattern 2 according to TS 38.133 [6] A.3.11.2
Synchronous cells	SSB indices of neigibour cells can be derived from timing of serving cell
Asynchronous cells	SSB indices of neigibour cells can not be derived from timing of serving cell

ReportConfigNR-DEFAULT: NR Report Configuration

Table H.3.1-4: ReportConfigNR-DEFAULT(Thres): NR report configuration for event A3 with a3-offset = Thres dB

Derivation Path: 38.508-1 table 4.6.3-107 with condition EVENT_A3			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
eventTriggered SEQUENCE {			
eventId CHOICE {			
eventA3 SEQUENCE {			
a3-Offset CHOICE {			
rsrp	Thres*2	a3 offset = Thres dB	
}			
hysteresis	[0]	0 dB	
timeToTrigger	ms0		
}			
}			
reportAmount	infinity		
reportQuantityRsIndexes ::= SEQUENCE {			SSB Index
rsrp	[FALSE]		
rsrq	[FALSE]		
sinr	[FALSE]		
}			
maxNrofRSIndexesToReport	[2]		SSB Index
includeBeamMeasurements	FALSE		SSB Index
}			
}			
}			

Condition	Explanation
SSB Index	To include SSB Index

QuantityConfig-DEFAULT: NR quantity configuration when L3 filtering is not used

Table H.3.1-5: QuantityConfig-DEFAULT: NR quantity configuration when L3 filtering is not used

Derivation Path: TS 38.331 [6], clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
QuantityConfig::= SEQUENCE {			
quantityConfigNR-List SEQUENCE (SIZE (1..maxNrofQuantityConfig)) OF SEQUENCE {	1 entry		
quantityConfigCell[1] SEQUENCE {			
ssb-FilterConfig SEQUENCE {			
filterCoefficientRSRP	fc0	No L3 filtering	
filterCoefficientRSRQ	fc0	No L3 filtering	
filterCoefficientRS-SINR	fc0	No L3 filtering	
}			
csi-RS-FilterConfig SEQUENCE {			
filterCoefficientRSRP	fc0	No L3 filtering	
filterCoefficientRSRQ	fc0	No L3 filtering	
filterCoefficientRS-SINR	fc0	No L3 filtering	
}			
}			
}			
}			

MeasGapConfig-DEFAULT: measurement gap configuration

Table H.3.1-6: MeasGapConfig: per-UE measurement gap configuration

Derivation Path: TS 38.331 [6], clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasGapConfig ::= SEQUENCE {			
gapUE CHOICE {			
setup SEQUENCE {			
gapOffset	39		Pattern #0 or Pattern #2 or Pattern #13
	19		Pattern #4
mgl	ms6		Pattern #0 or Pattern #4
	ms3		Pattern 2
	ms5dot5		Pattern 13
mgrp	ms40		Pattern #0 or Pattern #2 or Pattern 13
	ms20		Pattern #4
mgta	ms0		
}			
}			
}			

Condition	Explanation
Pattern #0	Measurement gap pattern #0 defined in TS 38.133 [6] Table 9.1.2-1 is used
Pattern #2	Measurement gap pattern #2 defined in TS 38.133 [6] Table 9.1.2-1 is used
Pattern #4	Measurement gap pattern #4 defined in TS 38.133 [6] Table 9.1.2-1 is used
Pattern #13	Measurement gap pattern #13 defined in TS 38.133 [6] Table 9.1.2-1 is used

MeasResults-DEFAULT: measurement result for FR1 NR measurements

Table H.3.1-7: MeasResults: measurement result for NR measurements

Derivation Path: TS 38.508-1, table 4.6.3-58 with condition A3			
Information Element	**Value/remark**	**Comment**	**Condition**
measResults SEQUENCE {			
measId	MeasId		
measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE {	1 entry		
servCellId[1]	ServCellIndex of NR SpCell		
measResultServingCell[1] SEQUENCE {			
physCellId	PhysCellId of NR SpCell		
measResult SEQUENCE {			
cellResults SEQUENCE {			
resultsSSB-Cell SEQUENCE {			
rsrp	(0..127)		
rsrq	(0..127)		
}			
}			
}			
}			
}			
measResultNeighCells CHOICE {			
measResultListNR SEQUENCE (SIZE(1..maxCellReport)) OF SEQUENCE {	1 entry		
physCellId[1]	PhysCellId of NR neighbour Cell		
measResult[1] SEQUENCE {			
cellResults SEQUENCE {			
resultsSSB-Cell SEQUENCE {			
rsrp	(0..127)		
}			
}			
rsIndexResults SEQUENCE {	*n* entires of ResultsPerSSB-Index	*ResultsPerSSB-IndexList*	SSB Index
ResultsPerSSB-Index SEQUENCE {	entry [1]		
ssb-Index	SSB-Index	an SS-Block within an SS-Burst	
}			
}			
…			
}			
}			
}			
}			

Condition	Explanation
SSB Index	To include SSB Index

H.3.2 to H.3.6

H.3.7 RRC messages and information elements contents exceptions for NR cell search when DRX is used

Table H.3.7-1: *MAC-CellGroupConfig:* NR intra-frequency cell search when DRX is used

Derivation Path: TS 38.508-1, Table 4.6.3-49			
Information Element	**Value/remark**	**Comment**	**Condition**
MAC-CellGroupConfig ::= SEQUENCE {			
drx-Config CHOICE {			
setup SEQUENCE {			
drx-onDurationTimer CHOICE {			
milliSeconds	ms1		DRX.1 or DRX.2
	ms6		DRX.3
}			
drx-InactivityTimer	ms1		
drx-RetransmissionTimerDL	sl1		
drx-RetransmissionTimerUL	sl1		
drx-LongCycleStartOffset CHOICE {			
ms40	9	To avoid overlapping with measurement gap	DRX.1 or DRX.3
ms640	9	To avoid overlapping with measurement gap	DRX.2
}			
shortDRX	not present		
drx-SlotOffset	0		
}			
}			
tag-Config SEQUENCE {			
tag-ToReleaseList	Not present		
tag-ToAddModList SEQUENCE (SIZE (1..maxNrofTAGs)) OF SEQUENCE {	1 entry		
tag-Id[1]	0		
timeAlignmentTimer[1]	ms500		DRX.1 or DRX.2
	infinity		DRX.3
}			
}			

Condition	Explanation
DRX.1	DRX Configuration 1 according to TS 38.133 [6] A.3.3.1
DRX.2	DRX Configuration 1 according to TS 38.133 [6] A.3.3.2
DRX.3	DRX Configuration 1 according to TS 38.133 [6] A.3.3.3

Annex I (informative): Change history

Change history

Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2017-08	RAN5#76	R5-175205	-	-	-	Introduction of TS 38.533	0.0.1
2018-08	RAN5#80	R5-184115	-	-	-	Added specification structure including headers up to third level	0.0.2
2018-11	RAN5#81	R5-186706	-	-	-	Added references and common sections	0.1.0
2018-11	RAN5#81	R5-187847	-	-	-	Added RMCs, OCGN, SMTC and SSB configurations to Annex A	0.1.0
2018-11	RAN5#81	R5-187996	-	-	-	Added test cases 6.7.1.1.1 to 6.7.1.2.2	0.1.0
2018-11	RAN5#81	R5-187997	-	-	-	Added test cases 4.6.2.1 to 4.6.2.8	0.1.0
2018-11	RAN5#81	R5-187998	-	-	-	Added test cases 5.6.2.1 to 5.6.2.4	0.1.0
2018-11	RAN5#81	R5-187999	-	-	-	Added test cases 6.6.2.1 to 6.6.2.8	0.1.0
2018-11	RAN5#81	R5-188000	-	-	-	Added test cases 7.6.2.1 to 7.6.2.4	0.1.0
2018-11	RAN5#81	R5-188001	-	-	-	Added test case 4.4.1.1	0.1.0
2018-11	RAN5#81	R5-188002	-	-	-	Added test cases 4.7.1.1.1 to 4.7.1.2.2	0.1.0
2018-11	RAN5#81	R5-188005	-	-	-	Added Annexes B to H	0.1.0
2018-11	RAN5#81	R5-188011	-	-	-	Added test case 4.4.3.1	0.1.0
2019-01	RAN5#4 5G-NR AH	R5-190448	-	-	-	Updating FR1 MU for timing measurements	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190476	-	-	-	Addition of band group power offsets	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190477	-	-	-	Update of the annexes	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190478	-	-	-	Changes to 4.7.1.x tests	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190479	-	-	-	Addition of 4.7.2.x tests	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190480	-	-	-	Addition of 4.7.4.x tests	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190481	-	-	-	Changes to 6.7.1.x tests	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190482	-	-	-	Addition of 6.7.2.x tests	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190483	-	-	-	Addition of 6.7.4.x tests	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190512	-	-	-	Addition of EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode test case 4.5.1.5	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190513	-	-	-	Addition of EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode test case 4.5.1.6	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190514	-	-	-	Addition of EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode test case 4.5.1.7	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190515	-	-	-	Addition of EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode test case 4.5.1.8	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190516	-	-	-	Addition of EN-DC FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC test case 4.5.2.1	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190517	-	-	-	Addition of EN-DC FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC test case 4.5.2.2	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190518	-	-	-	Addition of EN-DC FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC test case 4.5.2.3	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190519	-	-	-	Addition of EN-DC FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC test case 4.5.2.4	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190520	-	-	-	Addition of EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC test case 4.5.2.5	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190582	-	-	-	Annex F correction	0.2.0

2019-01	RAN5#4 5G-NR AH	R5-190803	-	-	-	Update Annex G in TS 38.533	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190874	-	-	-	Addition of NR test case 6.6.1.1-reporting without gap non-DRX	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190875	-	-	-	Addition of NR test case 6.6.1.2-reporting without gap DRX	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190876	-	-	-	Addition of NR test case 6.6.1.3-with gap non DRX	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190877	-	-	-	Addition of NR test case 6.6.1.4-with gap DRX	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190878	-	-	-	Addition of NR test case 6.6.1.5-without gap non DRX SBI reading	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190879	-	-	-	Addition of NR test case 6.6.1.6-with gap non DRX SBI reading	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190880	-	-	-	CR to 38.533 annex for event triggered reorting test cases	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190881	-	-	-	Addition of EN-DC FR1 event triggered reporting test case 4.6.1.5	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190882	-	-	-	Addition of EN-DC FR1 event triggered reporting test case 4.6.1.6	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190883	-	-	-	Addition of EN-DC FR1 event triggered reporting test case 4.6.1.3	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190884	-	-	-	Addition of EN-DC FR1 event triggered reporting test case 4.6.1.4	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190885	-	-	-	Addition of defualt config for event triggered test cases	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190886	-	-	-	Introduction of 5G RRM TC 4.5.3.1	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190887	-	-	-	Introduction of 5G RRM TC 4.5.3.2	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190888	-	-	-	Introduction of 5G RRM TC 4.5.3.3	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190889	-	-	-	Introduction of 5G RRM TC 4.6.1.1	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190890	-	-	-	Introduction of 5G RRM TC 4.6.1.2	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190891	-	-	-	Introduction of 5G RRM TC 5.5.3.1	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190892	-	-	-	Introduction of 5G RRM TC 6.6.3.1	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190893	-	-	-	pCR for Addition of TC 6.5.1.3 NR SA FR1 RLM OOS in DRX	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190894	-	-	-	pCR for Addition of TC 6.4.3.1 NR SA FR1 TAA Accuracy	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190895	-	-	-	pCR for Modification of TC 4.4.3.1 EN-DC FR1 TAA accuracy	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190896	-	-	-	pCR for Addition of TC 6.5.1.1 NR SA FR1 RLM OOS	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190897	-	-	-	pCR for Addition of TC 4.5.1.1 EN-DC FR1 RLM OOS	0.2.0

2019-01	RAN5#4 5G-NR AH	R5-190898	-	-	-	pCR for Addition of TC 4.5.1.3 EN-DC FR1 RLM OOS in DRX	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190899	-	-	-	Update to EN-DC FR1 transmit timing accuracy test	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190900	-	-	-	Addition of EN-DC FR1 RLM IS non-DRX test with SSB-based RLM RS	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190901	-	-	-	Addition of EN-DC FR1 RLM IS DRX test with SSB-based RLM RS	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190902	-	-	-	Addition of NR SA FR1 RLM IS non-DRX test with SSB-based RLM RS	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190903	-	-	-	Addition of NR SA FR1 RLM IS DRX test with SSB-based RLM RS	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190904	-	-	-	Correction of RRM 5G Test Cases 4.6.2 - EN-DC FR1-FR1 Inter-frequency measurements	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190905	-	-	-	Correction of RRM 5G Test Cases 6.6.2 - NR SA FR1-FR1 Inter-frequency measurements	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190906	-	-	-	Correction of RRM 5G Test Cases 7.6.2 - NR SA FR2-FR2 Inter-frequency measurements	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190907	-	-	-	Addition of RRM Test Cases 4.5.2.6: EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190908	-	-	-	Addition of RRM Test Cases 5.5.2.1: EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190909	-	-	-	Addition of RRM Test Cases 5.5.2.2: EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190910	-	-	-	Addition of RRM Test Cases 5.5.2.3: EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190911	-	-	-	Addition of RRM Test Cases 5.5.2.4: EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190912	-	-	-	Addition of RRM Test Cases 5.5.2.5: EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190913	-	-	-	Addition of RRM Test Cases 5.5.2.6: EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190914	-	-	-	Addition of RRM Test Cases 6.1.1.1: NR SA FR1 cell re-selection	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190915	-	-	-	Addition of RRM Test Cases 6.1.1.2: NR SA FR1-FR1 cell re-selection	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190916	-	-	-	Addition of cell re-selection to higher priority E-UTRAN test case 6.1.2.1	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190917	-	-	-	Addition of cell re-selection to lower priority E-UTRAN test case 6.1.2.2	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190918	-	-	-	Addition of SA NR to E-UTRAN handover test case 6.3.1.4	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190919	-	-	-	Addition of SA NR to E-UTRAN handover test case 6.3.1.5	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190920	-	-	-	Addition of NR SA FR1 UE UL carrier RRC reconfiguration delay test case 6.5.4.1	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190921	-	-	-	Addition of NR SA FR1 CSI-RS based RLM out-of-sync non-DRX test case 6.5.1.5	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190922	-	-	-	Addition of NR SA FR1 CSI-RS based RLM in-sync non-DRX test case 6.5.1.6	0.2.0

2019-01	RAN5#4 5G-NR AH	R5-190923	-	-	-	Addition of NR SA FR1 CSI-RS based RLM out-of-sync in DRX test case 6.5.1.7	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190924	-	-	-	Addition of NR SA FR1 CSI-RS based RLM in-sync in DRX test case 6.5.1.8	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190987	-	-	-	38.533 Common Section updates to clarify leverage across architecture options	0.2.0
2019-03	RAN5#82	R5-191484	-	-	-	Correction Annex G	0.3.0
2019-03	RAN5#82	R5-191485	-	-	-	Correction NSA Options	0.3.0
2019-03	RAN5#82	R5-191486	-	-	-	Modifications NSA FR1 SS-RSRP tests	0.3.0
2019-03	RAN5#82	R5-191487	-	-	-	Modifications NSA FR1 SS-RSRQ tests	0.3.0
2019-03	RAN5#82	R5-191488	-	-	-	Modifications NSA FR1 L1-RSRP tests	0.3.0
2019-03	RAN5#82	R5-191489	-	-	-	Modifications SA FR1 SS-RSRP tests	0.3.0
2019-03	RAN5#82	R5-191490	-	-	-	Modifications SA FR1 SS-RSRQ tests	0.3.0
2019-03	RAN5#82	R5-191491	-	-	-	Modifications SA FR1 L1-RSRP tests	0.3.0
2019-03	RAN5#82	R5-191492	-	-	-	Addition NSA FR1 BWP switch tests	0.3.0
2019-03	RAN5#82	R5-191493	-	-	-	Addition SA FR1 BWP switch tests	0.3.0
2019-03	RAN5#82	R5-191494	-	-	-	Addition NSA FR2 BWP switch tests	0.3.0
2019-03	RAN5#82	R5-191495	-	-	-	Addition SA FR2 BWP switch tests	0.3.0
2019-03	RAN5#82	R5-191720	-	-	-	addition of cell mapping for BFD and measurement	0.3.0
2019-03	RAN5#82	R5-191924	-	-	-	Correction of default message contents for RRM	0.3.0
2019-03	RAN5#82	R5-191926	-	-	-	Addition of event-triggered reporting Test Cases to Cell configuration mapping in Annex E	0.3.0
2019-03	RAN5#82	R5-191930	-	-	-	Correction of 5G RRM Test Case 4.6.2.3	0.3.0
2019-03	RAN5#82	R5-191931	-	-	-	Correction of 5G RRM Test Case 4.6.2.4	0.3.0
2019-03	RAN5#82	R5-191934	-	-	-	Correction of 5G RRM Test Case 4.6.2.7	0.3.0
2019-03	RAN5#82	R5-191935	-	-	-	Correction of 5G RRM Test Case 4.6.2.8	0.3.0
2019-03	RAN5#82	R5-191936	-	-	-	Addition of Minimum conformance requirements 5.6.2.0	0.3.0
2019-03	RAN5#82	R5-191937	-	-	-	Correction of 5G RRM Test Case 5.6.2.1	0.3.0
2019-03	RAN5#82	R5-191938	-	-	-	Correction of 5G RRM Test Case 5.6.2.2	0.3.0
2019-03	RAN5#82	R5-191939	-	-	-	Correction of 5G RRM Test Case 5.6.2.3	0.3.0
2019-03	RAN5#82	R5-191940	-	-	-	Correction of 5G RRM Test Case 5.6.2.4	0.3.0
2019-03	RAN5#82	R5-191945	-	-	-	Addition of Minimum conformance requirements 7.6.2.0	0.3.0
2019-03	RAN5#82	R5-191946	-	-	-	Correction of 5G RRM Test Case 7.6.2.1	0.3.0
2019-03	RAN5#82	R5-191947	-	-	-	Correction of 5G RRM Test Case 7.6.2.2	0.3.0
2019-03	RAN5#82	R5-191948	-	-	-	Correction of 5G RRM Test Case 7.6.2.3	0.3.0
2019-03	RAN5#82	R5-191949	-	-	-	Correction of 5G RRM Test Case 7.6.2.4	0.3.0
2019-03	RAN5#82	R5-191950	-	-	-	Correction of 5G RRM Test Case 7.6.2.5	0.3.0
2019-03	RAN5#82	R5-191951	-	-	-	Correction of 5G RRM Test Case 7.6.2.6	0.3.0
2019-03	RAN5#82	R5-191952	-	-	-	Correction of 5G RRM Test Case 7.6.2.7	0.3.0
2019-03	RAN5#82	R5-191953	-	-	-	Correction of 5G RRM Test Case 7.6.2.8	0.3.0
2019-03	RAN5#82	R5-192062	-	-	-	Update of EN-DC FR1 event triggered reporting test case 4.6.1.6	0.3.0
2019-03	RAN5#82	R5-192063	-	-	-	Update of EN-DC FR1 event triggered reporting test case 4.6.1.3	0.3.0
2019-03	RAN5#82	R5-192064	-	-	-	Update of EN-DC FR1 event triggered reporting test case 4.6.1.4	0.3.0
2019-03	RAN5#82	R5-192221	-	-	-	Update on RRC_Connected generic procedure within RRM tests	0.3.0
2019-03	RAN5#82	R5-192477	-	-	-	Introduction of FR1 EN-DC Contention based random access Test case	0.3.0
2019-03	RAN5#82	R5-192478	-	-	-	Introduction of FR1 EN-DC non-Contention based random access Test case	0.3.0
2019-03	RAN5#82	R5-192479	-	-	-	Introduction of FR1 standalone Contention based random access Test case	0.3.0
2019-03	RAN5#82	R5-192480	-	-	-	Introduction of FR1 standalone Non-contention based random access Test case	0.3.0
2019-03	RAN5#82	R5-192481	-	-	-	Updated to 5G RRM TC 4.6.1.1	0.3.0
2019-03	RAN5#82	R5-192482	-	-	-	Updated to 5G RRM TC 4.6.1.2	0.3.0
2019-03	RAN5#82	R5-192483	-	-	-	Addition of NR test case 6.7.1.3.1-absolute RSRP	0.3.0
2019-03	RAN5#82	R5-192484	-	-	-	Addition of NR test case 6.7.1.3.2-relative RSRP	0.3.0
2019-03	RAN5#82	R5-192485	-	-	-	Addition of NR test case 6.5.5.3 FR1 CSI-RS BFD nonDRX	0.3.0
2019-03	RAN5#82	R5-192486	-	-	-	Addition of NR test case 6.5.5.4 FR1 CSI-RS BFD DRX	0.3.0
2019-03	RAN5#82	R5-192487	-	-	-	Addition of NR test case 7.5.5.1 FR2 SSB BFD nonDRX	0.3.0
2019-03	RAN5#82	R5-192488	-	-	-	Addition of NR test case 7.5.5.2 FR2 SSB BFD DRX	0.3.0
2019-03	RAN5#82	R5-192489	-	-	-	Addition of NR test case 7.5.5.3 FR2 CSI-RS BFD nonDRX	0.3.0
2019-03	RAN5#82	R5-192490	-	-	-	Addition of NR test case 7.5.5.4 FR2 CSI-RS BFD DRX	0.3.0
2019-03	RAN5#82	R5-192492	-	-	-	Correction of 5G RRM Test Case 4.6.2.1	0.3.0
2019-03	RAN5#82	R5-192493	-	-	-	Correction of 5G RRM Test Case 4.6.2.2	0.3.0
2019-03	RAN5#82	R5-192494	-	-	-	Correction of 5G RRM Test Case 4.6.2.5	0.3.0
2019-03	RAN5#82	R5-192495	-	-	-	Correction of 5G RRM Test Case 4.6.2.6	0.3.0
2019-03	RAN5#82	R5-192496	-	-	-	Correction of 5G RRM Test Case 6.6.2.1	0.3.0
2019-03	RAN5#82	R5-192497	-	-	-	Correction of 5G RRM Test Case 6.6.2.2	0.3.0
2019-03	RAN5#82	R5-192498	-	-	-	Correction of 5G RRM Test Case 6.6.2.3	0.3.0

2019-03	RAN5#82	R5-192499	-	-	-	Correction of 5G RRM Test Case 6.6.2.4	0.3.0
2019-03	RAN5#82	R5-192500	-	-	-	Update of EN-DC FR1 event triggered reporting test case 4.6.1.5	0.3.0
2019-03	RAN5#82	R5-192503	-	-	-	Update to EN-DC FR1 transmit timing accuracy test	0.3.0
2019-03	RAN5#82	R5-192674	-	-	-	Update to EN-DC FR1 RLM IS non-DRX test with SSB-based RLM RS	0.3.0
2019-03	RAN5#82	R5-192675	-	-	-	Update to EN-DC FR1 RLM IS DRX test with SSB-based RLM RS	0.3.0
2019-03	RAN5#82	R5-192676	-	-	-	Update to NR SA FR1 RLM IS non-DRX test with SSB-based RLM RS	0.3.0
2019-03	RAN5#82	R5-192677	-	-	-	Update to NR SA FR1 RLM IS DRX test with SSB-based RLM RS	0.3.0
2019-03	RAN5#82	R5-192678	-	-	-	pCR for modification of TAAA TC for EN-DC FR1	0.3.0
2019-03	RAN#83	RP-190161	-	-	-	Presented to the RAN#83 plenary for 1-step approval	1.0.0
2019-03	RAN#83	-	-	-	-	Upgraded to Rel-15 with small editorial changes	15.0.0

History

Document history		
V15.0.0	May 2019	Publication